May 1973

Smithsonian

Antipollution blacksmith,
Dartmouth class of '71,
in Enfield, N.H. (p. 68)

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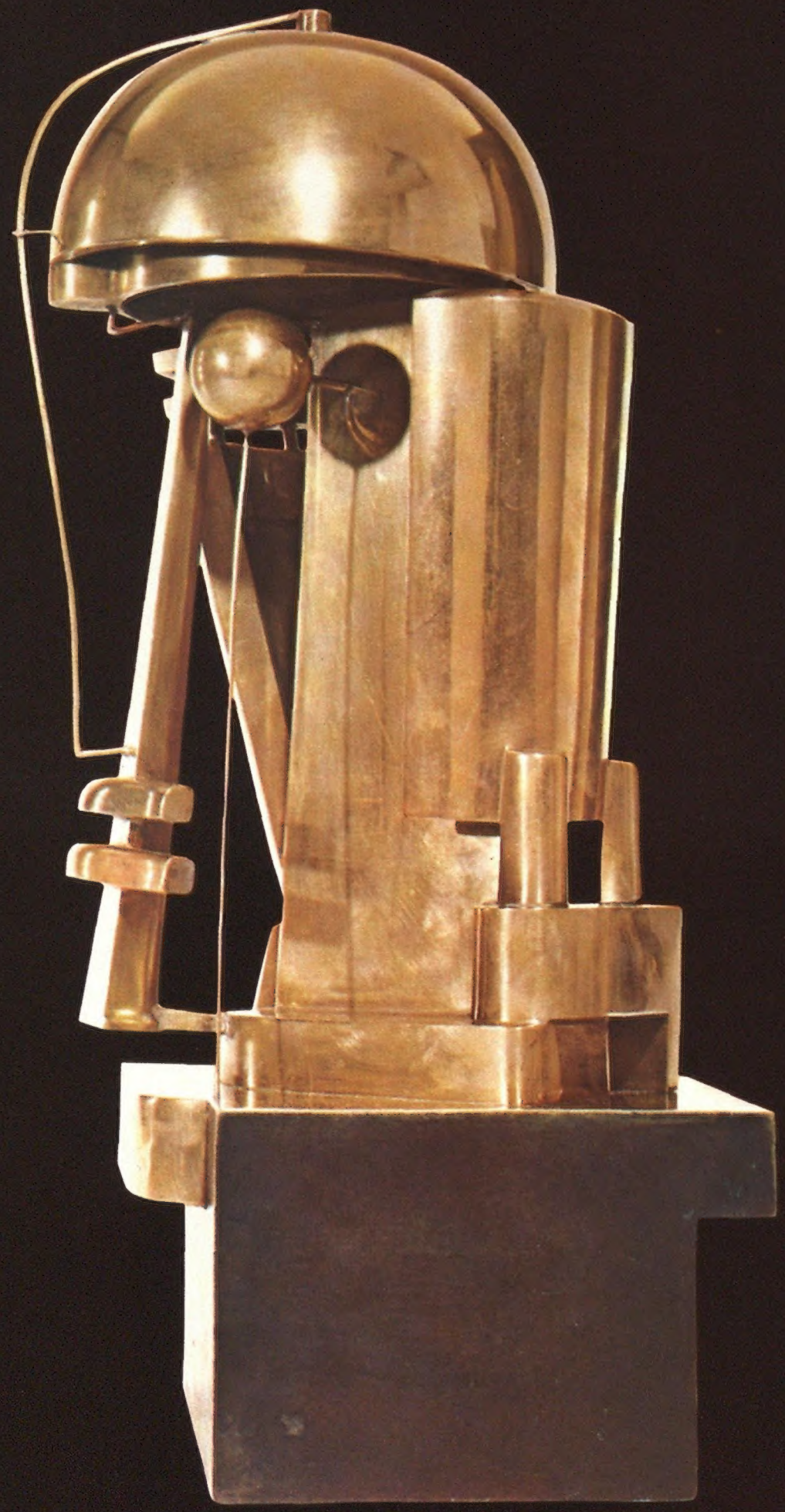
The real

We are forgetting how to be human beings. Power has become an end in itself. Instead of walking, we ride to the store. Instead of thinking, we ask a computer for answers. Instead of doing, we tell our machines to mix, brush, talk, write, even scratch for us. We have become a plugged-in, motorized society.



artist: belling museum of modern art

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Secretary Ripley's comments

The view from the castle

Now in their fifth year, 'twin' museums in the old Patent Office are booming, but they are not yet as well known as they should be

In the spring and autumn of 1968, two great new Smithsonian museums opened their doors in the splendidly refurbished old Patent Office Building, one of the noblest structures in this capital of imposing buildings. One, the National Portrait Gallery, was a new entity created by Congress within the Smithsonian complex. The other, the National Collection of Fine Arts, was a retitled version of the Institution's old National Gallery, which for many years had been virtually hidden away in the Museum of Natural History.

Now, five years later, I find ample reason to celebrate once again these magnificent institutions and their directors. It is impossible to go into either of the two neighboring galleries without being astonished at the wealth of objects in these beautiful halls, the lively activity and the atmosphere of innovation which permeates them.

Under Joshua C. Taylor, the National Collection has embarked on a series of exhibitions that point in new directions. One of these shows, "The Hand and the Spirit," was a pioneer exploration of American religious art. As critic Paul Richard reported in the *Washington Post,* "Jane Dillenberger and Joshua C. Taylor . . . have produced a brilliant show, illuminating the varying religious impulses that have fueled this nation's art." Mr. Richard also called Dr. Taylor's catalog essay "a classic, as fine a study of American art as I have read in years."

That was followed by "From Within," an extraordinary exhibition (organized by James Harithas, director of the Everson Museum of Art in Syracuse) of paintings by inmates of the maximum-security penal facility in Auburn, New York. It is exciting to see the power and range of styles derived from these stultifying and barren conditions.

Most recently, the staff of the NCFA—as we call it—demonstrated their range with another of their fine revivals, a "discovery" exhibition of the work of Alfred Maurer. He, like the black painter William H. Johnson (SMITHSONIAN, November 1971) and other relative unknowns, can fulfill an essential goal of this gallery: the filling in of gaps in American art history.

The National Portrait Gallery under Marvin Sadik has made a quantum jump into the fascination and fun of portrait exhibitions. Last summer's show of unsuccessful Presidential candidates, "If Elected . . . ," was stylish and spirited (SMITHSONIAN, June 1972). The perfect mix of portraits, artifacts, color and sound effects transported one into the very heart of a Presidential campaign. It was complemented by the catalog, a superb exercise in historical iconography which will be a landmark source in American history. We have a follow-up to this in "The Lazzaroni," which runs through May 6—a show devoted to that remarkable group of men who made national science policy in 19th-century America. At last we see the pattern of the National Portrait Gallery emerging as a living dictionary of American iconography.

These two museums have remade the wonderful old building. Visitors to Washington are only just beginning to discover them, plagued as they have been by nearby subway construction. Their future can only be glowing.

S. Dillon Ripley

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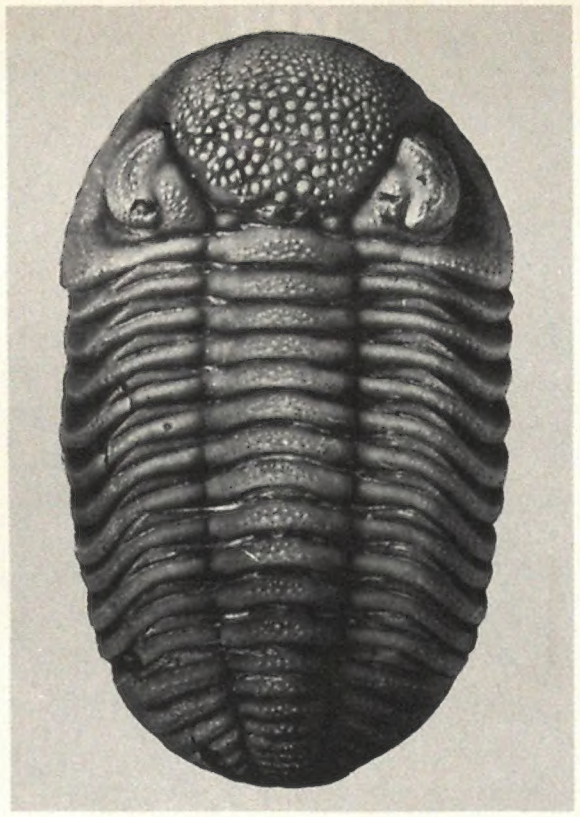
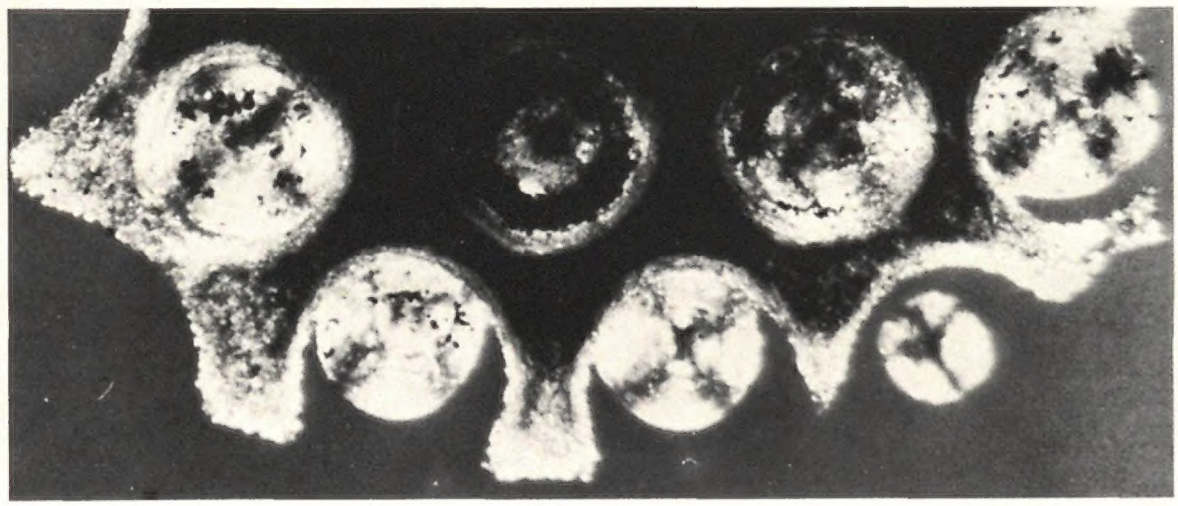
Phenomena, comment and notes

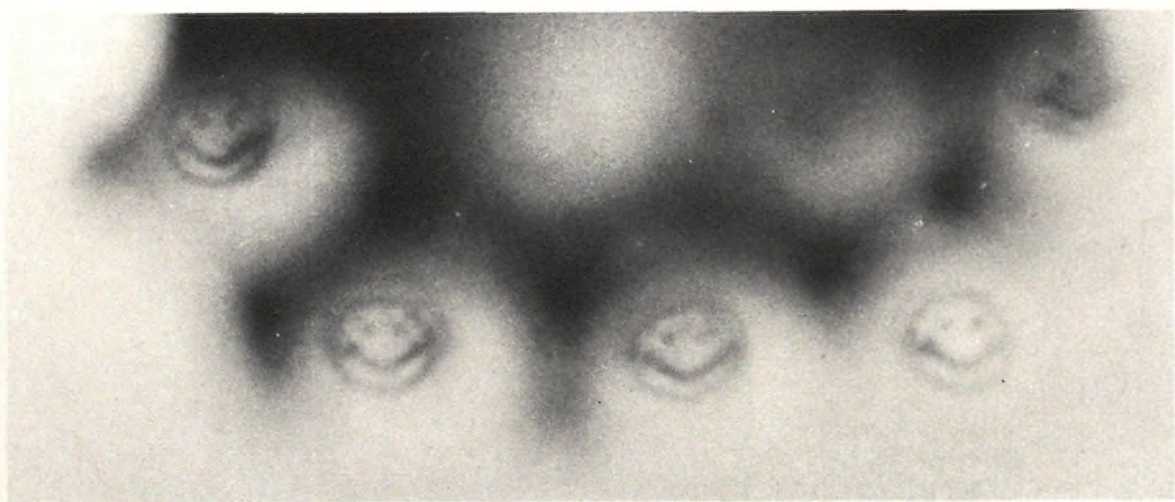
Potato chip pollution, Ice Age overkill, sickle cells and a glimpse through prehistoric eyes



A trilobite, 500 million years old.



Lenses in sliver of trilobite's compound eye, seen through microscope.



Same lenses as above still permit sharp, if not prehistoric, image.

This spring Arthur C. Clarke, the science-fiction writer, addressed a Frank Nelson Doubleday lecture audience at the Smithsonian National Museum of History and Technology and described the research by paleontologists as a kind of "time machine" permitting us to "see" the world millions of years ago. So precise are the techniques, said Clarke, that one can chronicle the changes of day to night by examining growth lines of certain fossils.

Next door, in the National Museum

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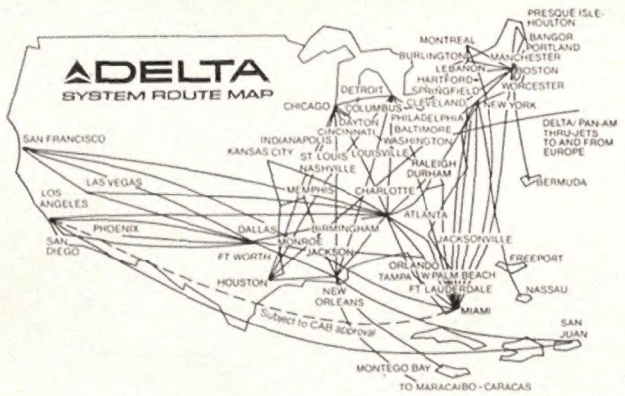

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of Natural History, a scientist has taken a different approach. He has given us a glimpse of how a trilobite might have seen its world. Trilobites are those small oval-shaped fossil arthropods that evolved some 500 million years ago and, until they died out, they were one of the Earth's dominant creatures, plying the Cambrian ocean bottoms and swimming near the surface by means of feathery branches on their legs.

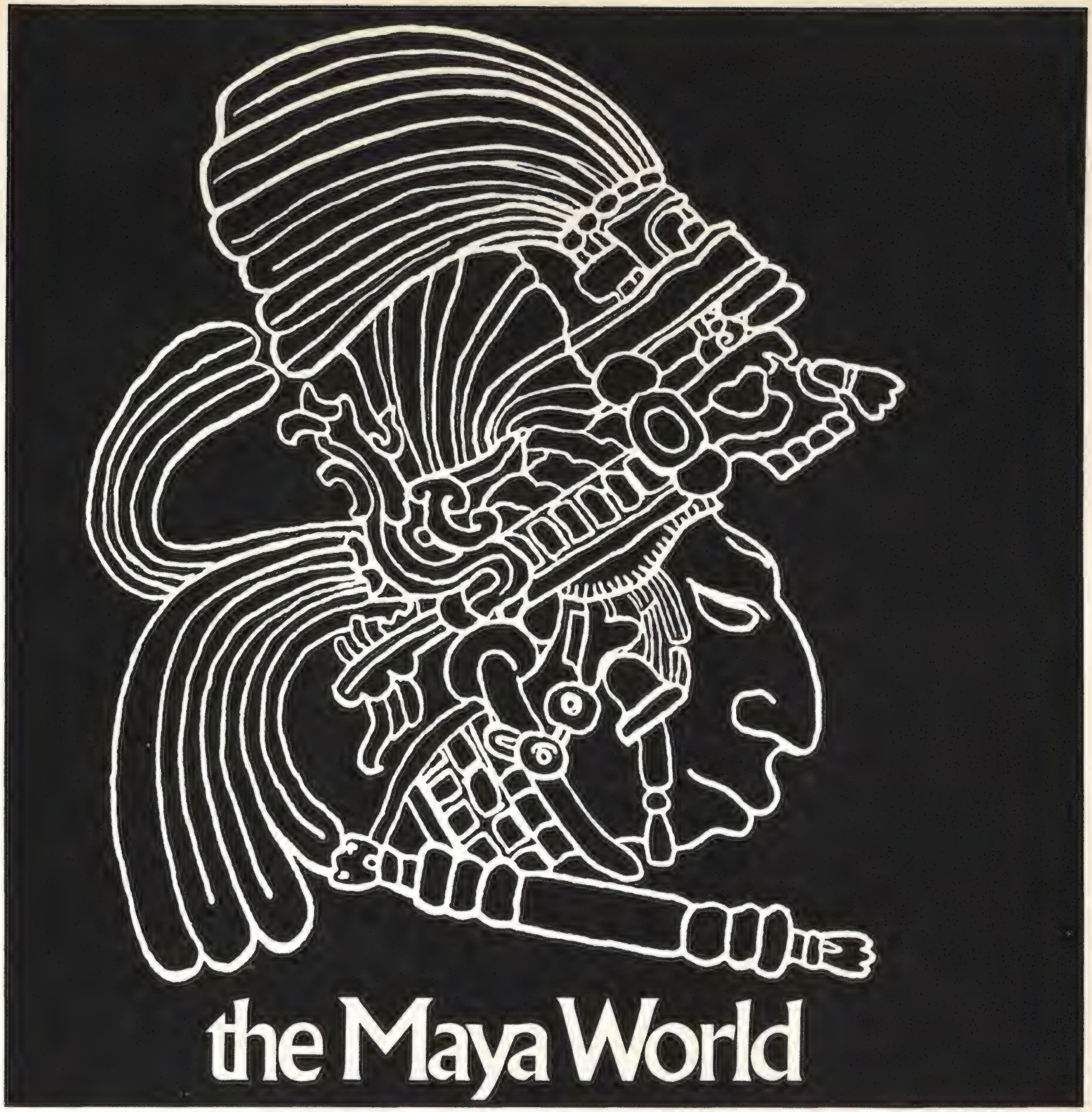
Kenneth Towe of the Smithsonian's paleobiology department has been looking into the trilobites' eyes—more specifically into their lenses which, he found, were impregnated with calcite while the animal was alive. What is almost unbelievable, says Towe, is that the crystal structure of the calcite is such that the lenses have the optical properties of glass. Some living arthropods have calcified lenses, too, but those of the trilobites were better, says Dr. Towe, who has looked through them.

He mounted some in clear epoxy, face down on glass slides, and peered at objects through them with a microscope. It is not known, he says, if the trilobites had the equipment to convert the images that passed through their lenses into actual perceptions of form, but it is clear that at least some trilobites had the optical equipment to form relatively sharp images over a depth ranging from a few millimeters to infinity (see photographs, previous page).

Defense and sickle cells

A recent suggestion that all black children in the District of Columbia public schools be screened for the genetic disease sickle-cell anemia caused a deep controversy. It smacked of social control, complained some black leaders, and furthermore it was discriminatory.

Sensing a complex social as well as medical situation in such matters, the Department of Defense sought the advice of the National Research Council on how to deal with screening recruits for sickle-cell diseases. In its report, written under the direction of Robert F. Murray jr. in the Medical Genetics Unit of Howard University, the Council noted that, contrary to the general belief, sickle-cell diseases are by no means limited to blacks. The report called for screening all recruits regardless of race, recommending that anyone with any sickle-cell disease



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should be excluded from duty with the armed services.

But people with the sickle-cell *trait* only—the benign carrier state—should not be excluded from service, even flight duty, except for pilots or copilots for whom the exigencies of low oxygen pressure may have some ill effects. There is no scientific reason, said the NRC, why people who have been found to have the trait should be excluded from other forms of hazardous duty.

The report also suggested that such genetic screening records be kept separate from other medical records and that the armed services launch an educational program to "emphasize that people of all races carry many mutant genes, that mutant genes can be beneficial, and that each race carries some detrimental mutant genes in high frequency."

Our first population explosion

It must have been a Pleistocene bed of roses for the first men on this continent, according to Paul S. Martin of the University of Arizona at Tucson. Having weathered the bone-chilling trip across the Bering Strait, the hunters would have soon found more temperate climates to the south and, importantly, vast quantities of big game that had not yet learned to be afraid of men. And, argues Martin, the big game never did learn to be afraid because the hunters underwent a population explosion, moving in a wave ever southward, leaving a wake of extinctions behind. Mammoths, mastodons, camels, early horses and a host of other large mammal species were wiped out between 10,000 and 11,200 years ago.

In an elaborate statistical analysis in *Science,* Martin says that this would have been ample time for man to migrate from what is now Alaska all the way to the tip of South America in his voracious pursuit of game.

Since the initial population explosion (and thus the resulting extinctions) would have occurred almost immediately after man's arrival on these shores, there is no need, Martin claims, to scurry around looking for evidence that man arrived here earlier than 12,000 years ago. But that is just what a number of scholars are doing and some are producing what they believe to be evidence that men were here as long as 27,000 years ago (see Phenomena, comment and notes, April 1973).

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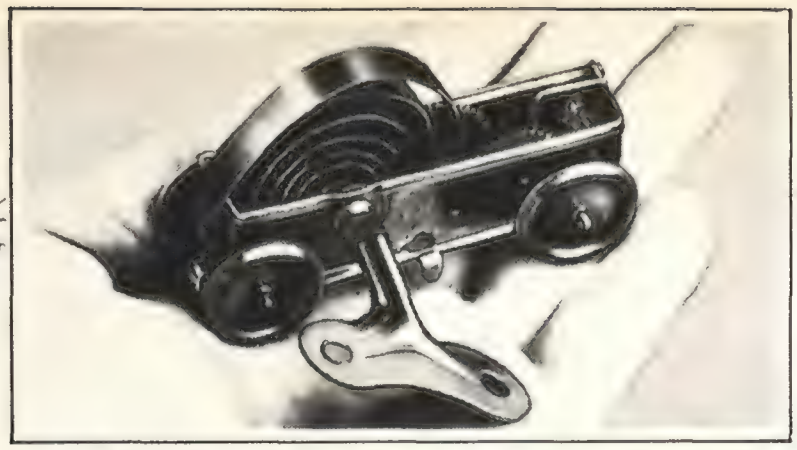

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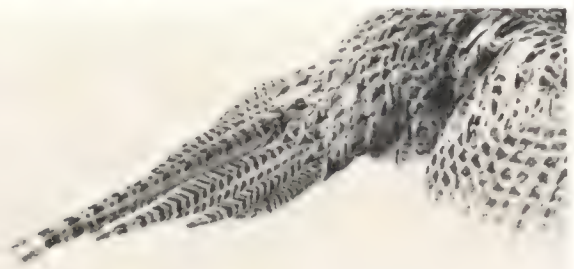

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That would mean that hunters arrived and waited thousands of years to swell dramatically in numbers—a situation so unlikely to Martin that he offers only one possible explanation for it: that "early man came over the Bering Strait without early woman."

Short-lived phenomena

Amid its customary earthquakes, volcanic eruptions and the other terrestrial grunts and groans that the Center for Short-lived Phenomena regularly chronicles, two recent events seem noteworthy:

The award for originality in oil spills goes to Allen Park, a community near Detroit. There, according to the Center, a storage tank developed a leak and from 6,000 to 10,000 gallons of oil ended up on the Rouge River, most of it remaining on the river's frozen surface.

What is so original about this one of hundreds of oil spills is that the pollutant was not crude oil, it was vegetable oil used by the people at Frito-Lay, Inc. to make potato chips. Apparently the oil seeped from the storage tank across the company parking lot and thence into the river during a period of two weeks. It fell to a local policeman (not a Frito-Lay employee slithering in and out of the parking lot every day) to notice that anything was awry.

It is a lucky thing that the United States is now on such good terms with China or a recently discovered invasion of some of our rivers might have caused unthinkable international problems. The Center reports that several rivers, including the Savannah, the Delaware and South Carolina's Pee Dee have been quietly infiltrated by the Chinese clam.

These clams have a potentially high rate of reproduction, so it is said, and no apparent natural enemy. Thus they can be a serious economic problem, clogging pipelines, fouling the water and crowding out other forms of marine life. From their size—a one-inch clam has been found in the Pee Dee, for example—it appears that the Chinese clams have been colonizing these eastern rivers for more than five years, even before Nixon took office. It also turns out that Chinese clams have been known on the West Coast since 1938, but no one knows (or will say) how they got there.

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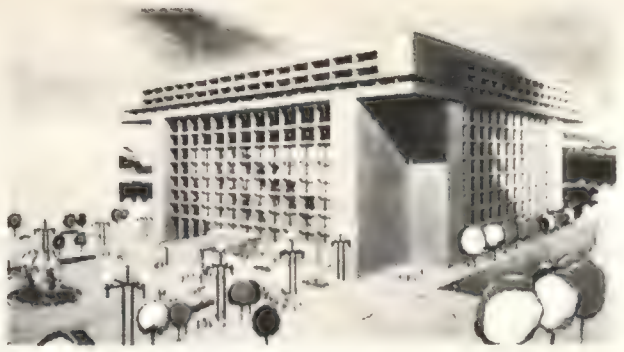

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Letters to the Editor

Black lechwe

Dear Sir: In regard to your article, "The black lechwe is an antelope to be preserved," in the March issue, you might be interested in the efforts of the Mzuri Safari Club Foundation toward the conservation of this animal.

Members first learned of the plight of the black lechwe in 1969 from the English artist David Shepherd. In 1970 at Lake Tahoe, Nevada, the foundation raised money by an auction of wildlife art. Through the efforts of a lot of people, a Bell JetRanger helicopter was shipped to Zambia in 1971. The Zambian Game Department has informed us that this helicopter has done a great deal to relieve the poaching pressure and stop illegal commercial hunting of the black lechwe.

Charles F. Huntington
Secretary, Mzuri Safari Club Foundation
San Francisco, California

Dear Sir: You may be interested to know that World Wildlife Fund issued a $16,440 grant last fall to launch a conservation program for the black lechwe in the Lake Bangweulu area. This program was initiated after we talked with a Zambian official more than a year ago, and we hope the program will be effective.

C.R. Gutermuth
President, World Wildlife Fund
Washington, D.C.

Copernicus

Dear Sir: While celebrating the 500th anniversary of Copernicus' birth, we should remember that Copernicus is honored by

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You'd expect an idea this good would spread fast, but only a few states have done anything about it. Where the law is strong and eliminates most lawsuits, insurance costs have come down. When the law doesn't reduce lawsuits, little is saved.

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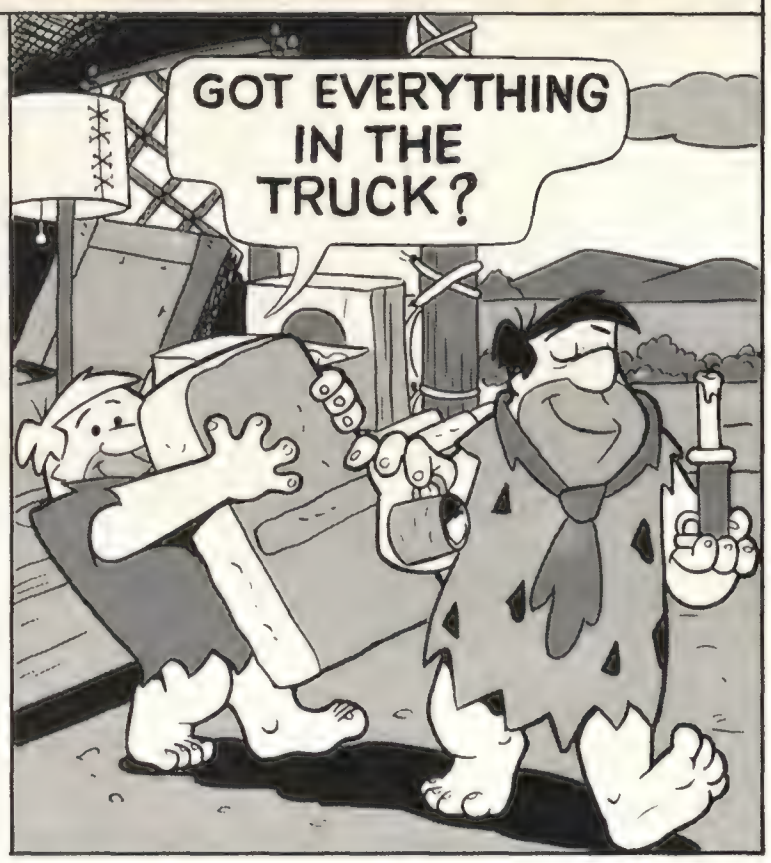

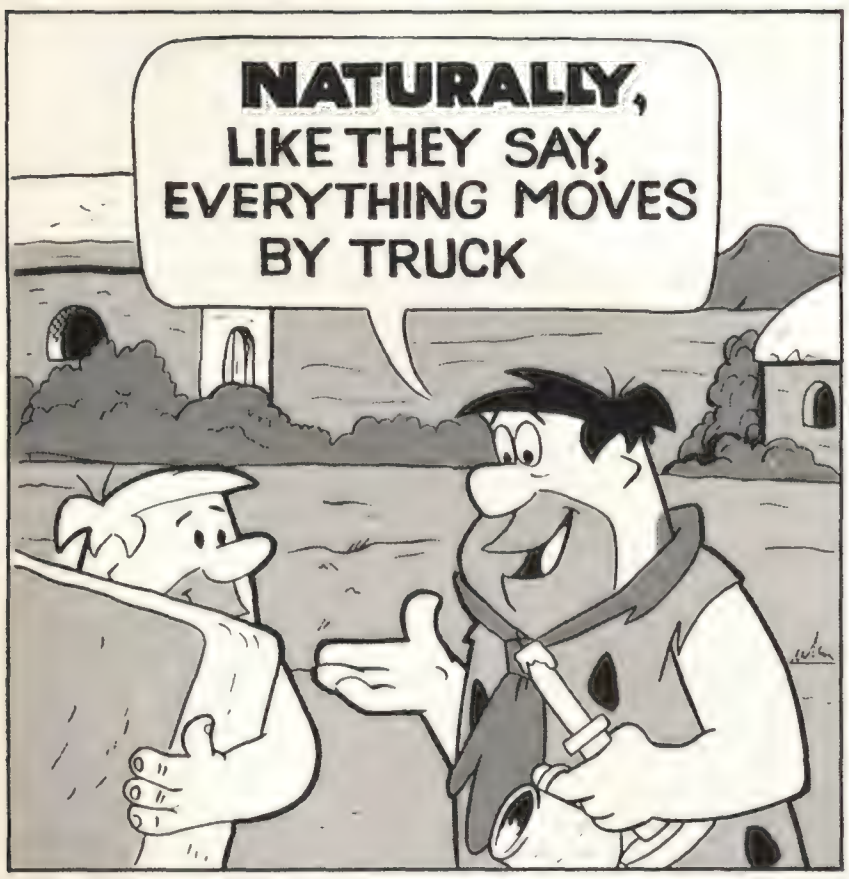

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a lunar crater, a recent U.S. space satellite (OAO-C) and asteroid 1322 Coppernicus (sic). Poland, Copernicus' birthplace, is commemorated by asteroid 1112 Polonia and the element polonium.
June LoGuirato
Clifton, Virginia

Black walnut

Dear Sir: After reading Hugh Moffett's article, "Pursuing the king of the walnuts," I want to plant some walnut trees on a large number of acres I own in the South. It would be very helpful to have the address of the company which produced the pamphlet, "Growing Walnut for Profit and Pleasure," mentioned in your article.
Louise P. Dolman
Philadelphia, Pennsylvania
For Mrs. Dolman and other readers who inquired, the address is: The American Walnut Association, 666 North Lake Shore Drive, Chicago, Illinois 60611. Ed.

Circus wagons

Dear Sir: While reading Armand B. Ferrara's article on the old circus wagons at Baraboo, Wisconsin, I recalled my visit last year with Bill Thallmayer (see below), once a carver of wood in Hungary.

At that time he was busily repairing a griffin. I watched him thunk, chip and scrape away coats of paint to reveal genuine gold leaf. He drilled, doweled and then glued on a missing claw. By eye and feel, he patterned a wing, later to be carved to full feathered form.

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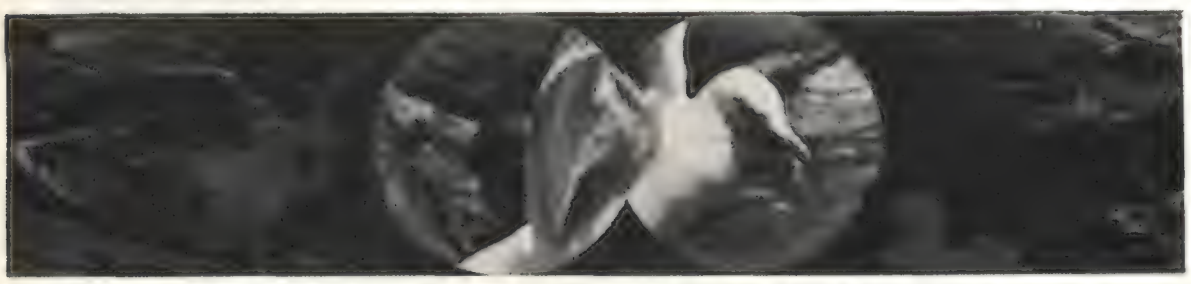

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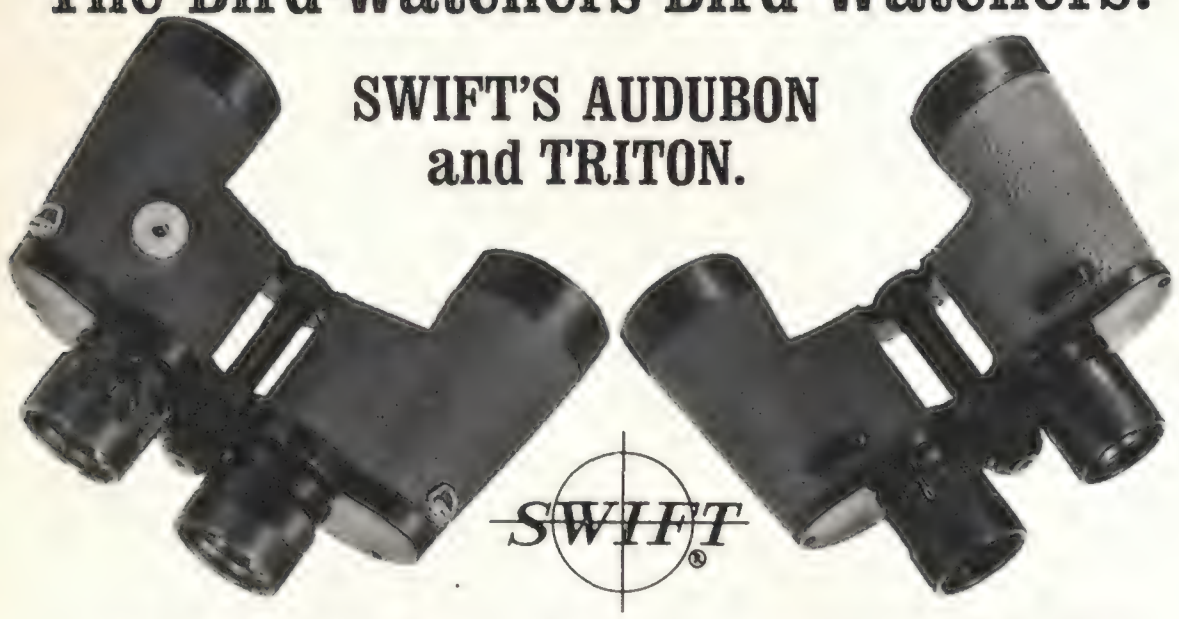

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E.F. Lindsley
Midwest Editor, *Popular Science*
Delafield, Wisconsin

Synthesizers

Dear Sir: Your article on synthesizers reminded me of three inventions in Germany prior to World War II. One was by Jörg Mager, who built what he called a Sphärophon; its novelty was that, beside the regular keyboard, it had a second keyboard. Another was an electronic grand piano built by Bechstein; it was played like a regular piano, using small hammers and loudspeakers, which made it sound like a modern electronic organ. The third was the Trautonium, an electronic instrument, built by Friedrich Trautwein.

These instruments were too far ahead of their time.
H. John Bessunger
Hampton Bays, New York

Old-style farming

Dear Sir: Congratulations on the article, "Old-style farming suits these sisters," describing the simple life of Lynn and Leora Tusing in the hills of West Virginia.

How refreshing and uplifting to our faith in this great country to realize that there still exist such genuine, rugged, honest, self-respecting and self-sufficient people. They formed the backbone of our nation and contributed much more than they know.
Russell E. Osborne
Toledo, Ohio

Dear Sir: I spotted an error in your enjoyable article on the Tusing sisters. As a weaver, I noted that you called the warp beam the one that grows fat; actually, it is the one that grows thin, while the work beam is the one that grows fat.
Edward E. Gordon
Pinellas Park, Florida
Mr. Gordon is correct. Ed.

Passionflowers

Dear Sir: Dr. Edward S. Ayensu's interesting article on passionflowers reminds me of my experience in Trinidad. I planted *Passiflora edulis* along an ugly wire fence and obtained fruit about two-thirds the size of an American football. In April, I had put in 12 plants and, between Christ-

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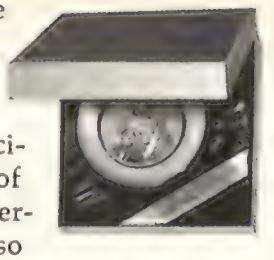

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mas and New Year's, they produced more than 40 enormous fruits. I was hardly able to persuade the supermarkets to take them—especially when people were recovering from Christmas feasts.

John Kay
Chevy Chase, Maryland

Frederick Law Olmsted

Dear Sir: The picture in your December 1972 issue of a bearded man (with a woman companion) on horseback in front of a waterfall in the Yosemite Valley, which you, *Life*, the National Gallery, the Whitney Museum *et al* have accepted as a picture of Frederick Law Olmsted taken about 1864, is a case of mistaken identity.

Olmsted did not wear a beard until the 1880s. From his own account, given in March 1890, he had not entered the Yosemite Valley since his last visit there in the fall of 1865. And he never returned to California after 1890.

Mrs. W. Crosby Roper jr.
Washington, D.C.

Mrs. Roper seems to be correct. Ed.

Lafayette Escadrille

Dear Sir: I see that my friend Bruce English, in his letter published in the February issue, has credited me with being a member of the Lafayette Escadrille. I'm afraid he has the wrong Lovell. I was in the 22nd Aero (Pursuit) Squadron.

W.V. Lovell
Sanford, Florida

Patrick Ryan

Dear Sir: In concluding his column in the March issue on the scarcity of caviar and other edible delicacies, Patrick Ryan apparently meant to console readers by asserting that "all is not over for the Lucullan celebrant," since there is still "an ample supply" of what Ryan obviously considers another gourmet's delight: "well-stacked young ladies willing to leap naked and giggling out of giant birthday cakes. . . ."

Frankly, it doesn't cheer me up at all to see an author confusing people with products. And besides, there's practically nothing I'm less likely to order at my own Lucullan celebrations. If I can't get caviar, I'll just stick to champagne.

Nancy Steele
Philadelphia, Pennsylvania

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By Sir Peter Medawar

What's human about Man is his technology

A distinguished British scientist argues that we are inseparable from our tools and must now choose to evolve a new set

The use of tools has often been regarded as the defining characteristic of *Homo sapiens.* It has been thought of as the taxonomically distinctive characteristic of the species. But there is evidence that non-human primates and even lower animals can use tools —something Jane van Lawick-Goodall has shown to be true of chimpanzees and baboons and that is true also of the Galápagos woodpecker. In light of this, the view is now gaining ground that what is characteristic of human beings is not so much the devising of tools as the communication from one human being to another of the know-how to make them.

For example, it was not the devising of a wheel that was distinctively human, we may suggest, but the communication to others, particularly in the succeeding generation, of the way to make one. This act of communication, however rudimentary it may have been—even if it only took the form of a rudely explanatory gesture signifying "It's like this, see," accompanied by a rotatory motion of the arm—marks the beginning of technology or the science of engineering.

Everyone has observed with more or less wonderment that the tools and instruments devised by human beings undergo an evolution themselves that is strangely analogous to ordinary organic evolution, almost as if these artifacts propagated themselves as animals do. Aircraft began as birdlike objects but evolved into fishlike objects for much the same fluid-dynamic reasons as those which caused fish to evolve into fishlike objects. (Even toothbrushes have evolved, though not very much. I have never seen Thomas Jefferson's toothbrush, but I don't suppose it was very much different from the one we use today; the Duke of Wellington's, which I *have* seen, certainly was not.)

To some Victorian thinkers, such as Herbert Spencer, facts like these served simply to confirm them in the belief that evolution was the fundamental and universal modality of change. The assimilation of technological to ordinary organic evolution had substance, because all instruments are functionally parts of ourselves. Some instruments like spectrophotometers, microscopes and radio telescopes are sensory accessories inasmuch as they enormously increase sensibility and the range and quality of the sensory input. Other instruments like cutlery, hammers, guns and automobiles are accessories to our effector organs; they are not sensory but motor accessories.

A property that all these instruments have in common is that they make no functional sense except as external organs of our own: All sensory instruments report back at some stage or by some route through our ordinary senses. All motor instruments receive their instructions from ourselves.

It was for reasons like this that the great actuary and demographer Alfred J. Lotka of the Metropolitan Life Insurance Company invented the word "exosomatic" to refer to those instruments which, though not

In front of Greenough's *Washington,* Lady Medawar and Sir Peter arrange his notes for his Frank Nelson Doubleday lecture at the Smithsonian's Museum of History and Technology. Sir Peter is a former director of England's National Institute of Medical Research and a Nobel laureate (medicine and physiology). This article has been adapted from his lecture on evolution and technology.

What is distinctively human is not devising, say,
the wheel, so much as passing the idea along.

Illustrated by Robert Osborn

parts of the body, are nevertheless functionally integrated into ourselves. ("Exo" signifies "out of" or "beyond"; "soma" signifies "the body.")

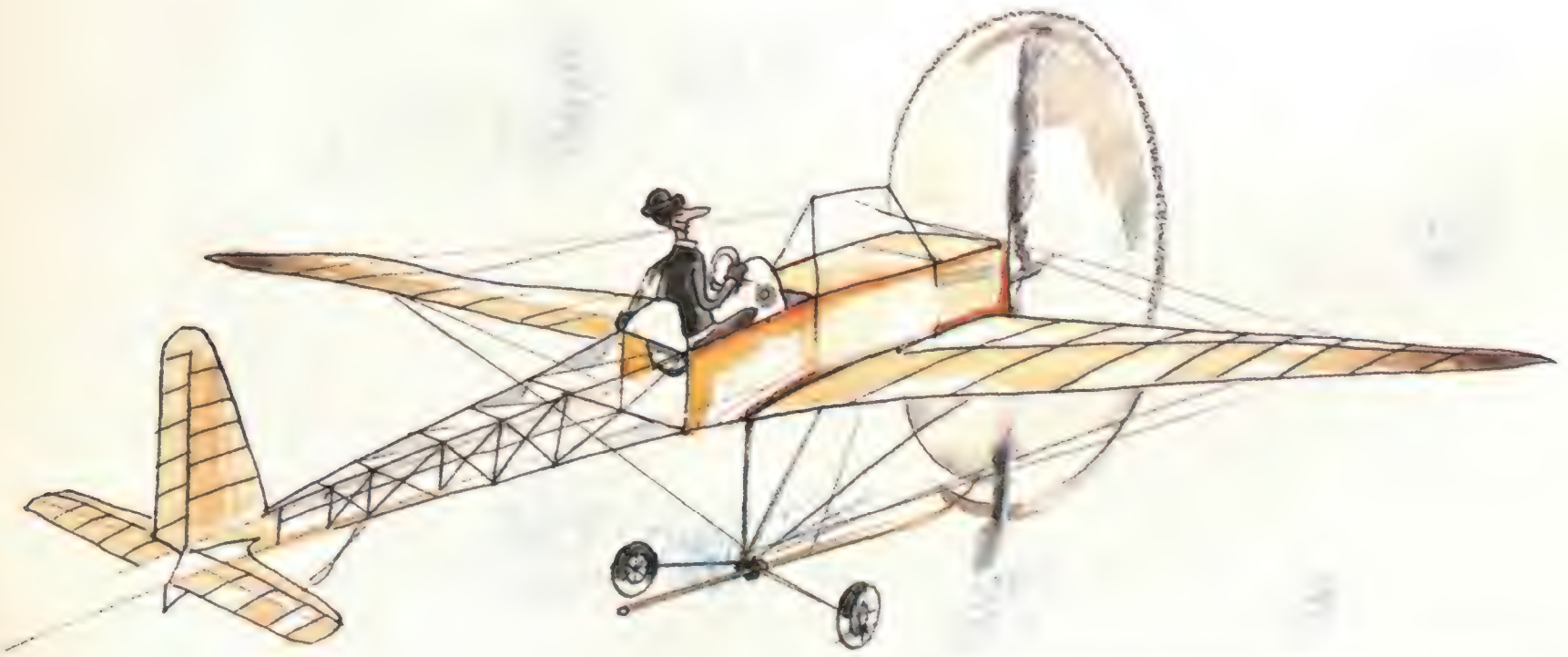
Everybody will have realized from personal experience how closely we are integrated psychologically with the instruments that serve us. When a car bumps into an obstacle, we wince more through an actual referral of pain than through a sudden premonition of the sour and skeptical face of an insurance assessor. When the car is running badly and labors up hills, we ourselves feel rather poorly, but we feel good when the car runs smoothly. Wilfred Trotter, the British surgeon, said that when a surgeon uses an instrument like a probe, he actually refers the sense of touch to its tip. The probe has become an extension of his finger. Jane van Lawick-Goodall defines a "tool" as a functional extension of an organ such as the hand or the mouth.

I do not think I need labor the point that this proxy evolution of human beings through exosomatic instruments has contributed more to our biological success than the conventional evolution of our own (or "endosomatic") organs. But I do think it is worthwhile calling attention to some of the more striking differences between the two.

By far the most important difference is that the instructions for making endosomatic parts of ourselves like kidneys and hearts and lungs are genetically programmed. There is no learning process in ordinary genetic heredity. We can't teach DNA anything. Instructions for making exosomatic organs, on the other hand, are transmitted through nongenetic channels.

There was for a time a theory of biological evolution called Lamarckian after the French biologist, Jean Baptiste Lamarck. This theory held that characteristics acquired by an organism during its lifetime could be passed along to the next generation. That is, in a highly exaggerated example, an Olympic swimmer could transmit to his children the musculature already suitable for championship swimming. Genetics simply does not work that way. In Darwinian evolution, variations are ready-made and those which give their possessors an advantage are selected and become the prevailing type.

Through the direct action of the environment the human body does, in a sense, "learn" to develop a thicker skin on the soles of the feet than elsewhere. But information of this kind cannot be passed on genetically and there is no known mechanism by which it could be. Each set of human feet must "learn" it afresh. It is only in exosomatic heredity that ac-



Technological evolution can parallel biological evolution. Planes began as birdlike objects.

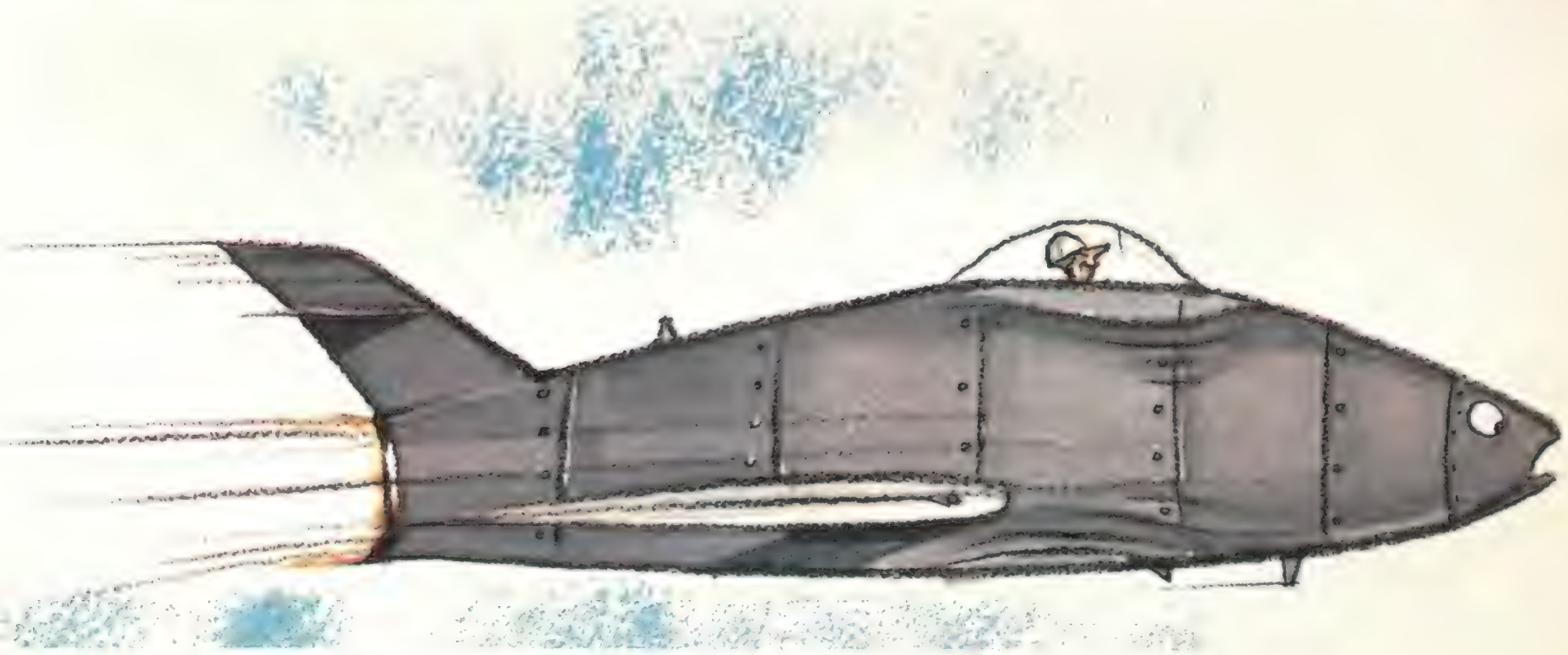
As extensions of our own organs, tools are very definitely part of human evolution.

quired characteristics can be transferred. We can learn to make and wear shoes and pass this knowledge on to the next generation. Indeed, we can even pass on the shoes themselves.

Thus exosomatic heredity is Lamarckian or instructional in style, rather than selective. By no manner of means can the blacksmith transmit his brawny arms to his children, but there is nothing to stop him from teaching his children his trade, so that they grow up to be as strong and skillful as himself. The evolution of this learning process and the system of heredity that goes with it represents a fundamentally new biological strategem—more important than any that preceded it—and totally unlike any other transaction of the organism with its environment.

Another important difference is this: Genetic evolution is conceivably reversible just as it is thermodynamically conceivable that a kettle of water put on a lump of ice will boil. It's very unlikely, that's all. On the other hand exosomatic evolution is quite easily reversible. Everything that has been achieved by it can be lost or not reacquired. This is what specially frightens us when we contemplate the consequences of some particularly infamous tyranny which threatens to interrupt the cultural nexus between one generation and the next. This reversion to a cultural Stone Age is what each political party warns us will be the inevitable consequence of voting for the other. To bring the idea of reversibility to life one should contemplate the plight of the human race if for any reason it did have to start again from scratch on a desert island. As every mother knows, it is not heaven but the old Stone Age that lies about us in our infancy.

I have been looking around in my mind for some



Planes then became fishlike objects for much the same reasons that fish became fishlike.

one word or phrase to epitomize what I understand by our human inheritance through nongenetic channels—through indoctrination, that is, and the conscious transfer of information by word of mouth and through books. A new book by the philosopher Karl Popper, called *Objective Knowledge,* supplied the answer. (Popper is the author also of *The Open Society and its Enemies,* for many the most important work of social philosophy since Karl Marx's *Das Kapital,* of which it is in some senses a refutation.) Let me introduce you to Popper's concept of a "third world."

According to the philosophic views we specially associate with the name of George Berkeley, the apparently "real" world about us exists only through and by virtue of our apprehension of it. Thus sensible things and material objects generally exist only as representations or conceptions or as "ideas" in the mind—hence the name "idealism." Berkeley argued persuasively, and James Boswell (always on the lookout for copy for his great biography of Johnson and not too proud to create it) very well knew that Berkeley's argument was of just the kind that would enrage Dr. Johnson. When Boswell teasingly said it was impossible to refute Berkeley's beliefs, Johnson said, "I refute it *thus,*" kicking a large stone so violently that he "rebounded" from it, thus simultaneously refuting Berkeley and confirming the second Newtonian law of motion which declares that every action has an equal and opposite reaction.

Even those, however, who take a sturdily Johnsonian or commonsensical view of Berkeley's philosophy as it relates to the real world of material objects, sometimes hold a Berkeleian or subjectivist view of things of the mind. They tend to believe that thoughts exist by reason of being thought about, conceptions by virtue of being conceived and theorems because they are the product of deductive reasoning.

Artifacts of the mind have an existence of their own: We "grasp" ideas and we "handle" numbers.

Man's major inheritance

Popper does away with subjectivism in the world of the mind. Human beings, he says, inhabit or interact with three quite distinct worlds. World 1 is the ordinary physical world or a world of physical states; World 2 he describes as the mental world or world of mental states. The "third world" (you can see why he now prefers to call it World 3) is the world of actual or possible objects of thought, the world of concepts, ideas, theories, theorems, arguments and explanations —the world of all artifacts of the mind. The elements of this world interact with each other much like the ordinary objects of the material world: Two theories interact and lead to the formulation of a third.

Again, I mention for what it is worth that we speak of things of the mind in a revealingly objective way: We "see" an argument, "grasp" an idea and "handle" numbers expertly or inexpertly as the case may be. The existence of World 3, inseparably bound up with human language, is the most distinctively human of all our possessions. This third world is not a fiction, Popper insists, but exists "in reality." It is a product of the human mind but yet is largely autonomous.

This then was the conception I had been looking for. This third world is the greater and more important part of human inheritance. Its transmission from generation to generation is what above all else distinguishes man from beast.

"I refute it *thus!*" roared Samuel Johnson,
painfully disproving Bishop Berkeley's idealism.

Popper has argued strongly that although the third world is a human artifact, it has an independent objective existence of its own—and is indeed quite largely autonomous. I have already pointed out that the third world undergoes the kind of slow, secular change that is described as evolutionary. That is, it is gradual, directional and integrative in the sense that it builds upon whatever level may have been achieved beforehand. The continuity of the third world depends upon a nongenetic means of communication and the evolutionary change is generally Lamarckian in character, but there are certain obvious parallels between exosomatic evolution and ordinary organic evolution in the Darwinian mode. Consider again, for example, the evolution of aircraft and of automobiles. A new design is exposed to pretty heavy selection pressures through consumer preferences, "market forces" and the exigencies of function, by which I mean that the aircraft must stay aloft and the cars must go where they are directed. A successful new design sweeps through the entire population of aircraft and automobiles and becomes a prevailing type much as jet aircraft have replaced aircraft driven by propellers.

I hope it is not necessary to say that the secular changes undergone by the third world do not exemplify and are not the product of the workings of great impersonal historical or sociological forces. Just as the third world, objectively speaking, is a human artifact, so also are all the laws and regulations which govern its transformations. The idea that human beings are powerless in the grip of vast historical forces is, in the very deepest sense of the word, nonsensical. Fatalism is the most abject form of this aberration of thought, which Popper calls "historicism." Its acceptance or rejection has not depended upon cool philosophic thought but rather upon matters of mood and of prevailing literary fashion. There was quite a fashion for fatalism in late Victorian and Edwardian England, admirably exemplified by Fitzgerald's famous stanza in *The Rubáiyát of Omar Khayyám:*

> *'Tis all a Checkerboard of Nights and Days*
> *Where Destiny with Men for Pieces plays:*
> *Hither and thither moves, and mates, and slays,*
> *And one by one back in the Closet lays.*

Some people believe we have injured the ecology
of Earth so badly that we should be punished.

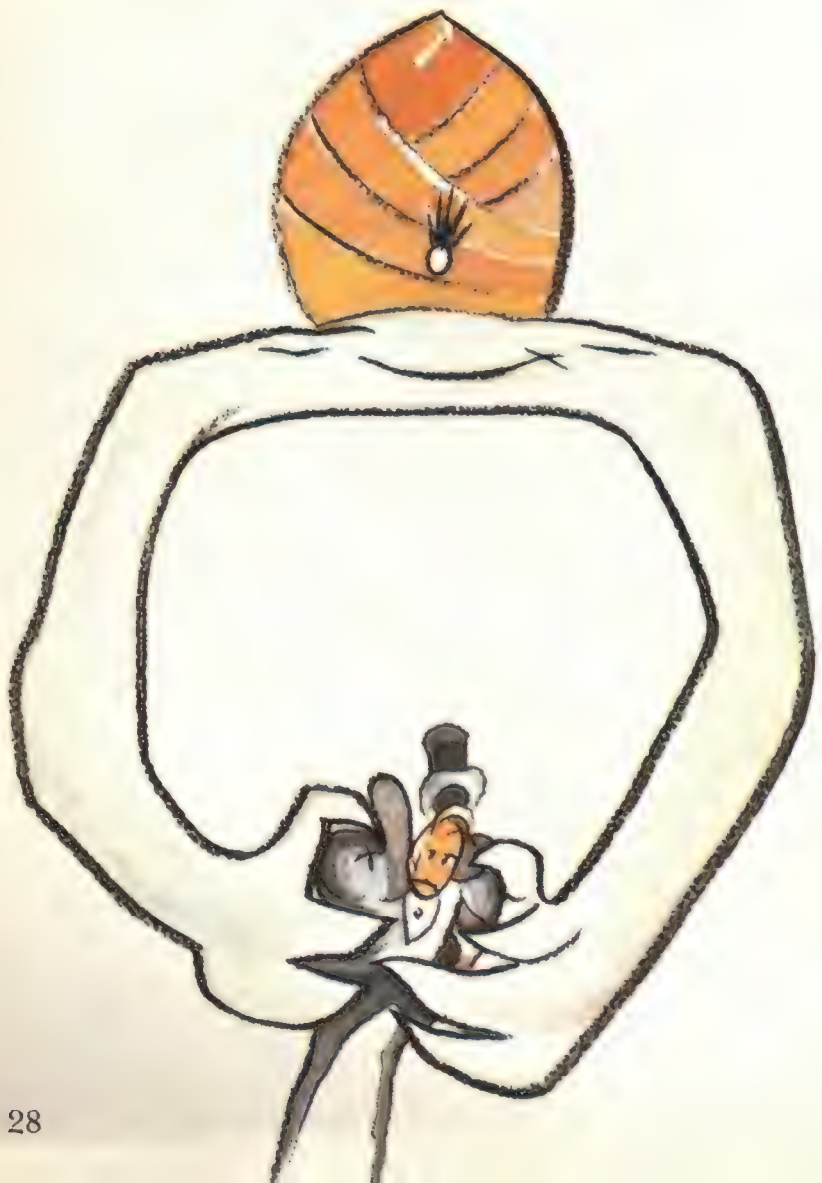
This is a comfortable doctrine insofar as it spares us any exertion of thinking, but we may well wonder why it was so prevalent in late Victorian and Edwardian England. The answer surely is that it fits very well with that high Tory and latterly Fascist philosophy according to which, regardless of his upbringing and of any efforts he may have made to improve his condition, a man's breeding and genetic provenance fix absolutely his capabilities, his destiny and his deserts: A man not born a gentleman or, say, a German could only at best merely simulate gentility or Germanity.

This kind of fatalism sounds very dated today but we should ask ourselves very seriously whether there is not a tendency nowadays to take the almost equally discreditable view that the environment has now deteriorated beyond anything we can do to remedy it—that man has now to be punished for his abandonment of that nature which according to the scenario of a popular Arcadian daydream should provide for all our reasonable requirements and find a remedy for all our misfortunes. It is this daydream that lies at the root of today's rancorous criticism of science and the technologies by people who believe and seem almost to hope our environment is deteriorating to a level below which it cannot readily support human life.

My own view is that these fears are greatly and unreasonably exaggerated. Our present dilemma has something in common with those logical paradoxes that have played such an important part in mathematical logic. Insofar as any weapon can be blamed for any crime, science and technology are responsible for our present predicament but they also offer the only possible means of escaping the misfortunes for which they are responsible.

The coming of technology and the new style of human evolution it made possible was an epoch in biologic history as important as the evolution of man himself. Indeed, the two cannot be considered separately. We are now on the verge of a third episode as important as either of these: that in which the whole human ambience, the human house, is of our own making and becomes as we intend it should be, a product of human thought—of deep and anxious thought, let us hope, and of forethought rather than afterthought. Such a union of the first and third worlds of Popper's scheme is entirely within our capabilities provided it is henceforward made a focal point of creative thought. A blueprint for such an effort is described in the book, *Only One Earth,* by Barbara Ward and René Dubos, written in preparation for the U.N. World Conference on the Human Environment held in Stockholm last year.

The word ecology has its root in the Greek word *oikos* meaning "house" or "home." Our future success depends upon the recognition that household management in this wider sense is the most backward branch of technology and therefore the one most urgently in need of development. An entirely new technology is required, one founded on ecology in much the same way as medicine is founded on physiology. If this new technology is accepted, I shall be completely confident of our ability to put and keep our house in order.



Criers of ecologic doom are as misguided as fatalistic Edwardians who were enthralled by Omar Khayyám.

The word "ecology" derives
from the Greek for "house,"
and household management
is the most backward
branch of our technology.
It is time for us to create
an entirely new technology.

Text and Photographs by Richard Erdoes

My travels with medicine man John Lame Deer

It started as a publicity tour for a book, but became an often hilarious mission to teach unwitting whites the ways of an old Sioux

"I'm not a dog that can be trained, made to sit up and give paw. We Sioux are like cats. You can't make us do anything unless we want to."

Thus John Lame Deer, Sioux medicine man and old friend, when I suggested to him that some things were unsuitable to be aired on TV interviews. We had been sent on tour to publicize our book, *Lame Deer—Seeker of Visions,* and I was still learning more about the making of a medicine man every day. In a Midwestern town, for example, we were confronted by a lady interviewer who asked: "Mr. Lame Deer, what exactly does a medicine man do?"

Long pause. "Well, one thing I do is listening to the animals, the birds, even the little plants. They tell me things."

"You must be putting me on! Listening to animals and plants in this day and age? Come on, now."

John looked at her hard, arms folded on his chest. "Lady, in your Bible a woman talks to a snake. I, at least, talk to eagles."

Lame Deer, originally from the Rosebud reservation in South Dakota, says there's no white man's word to describe accurately what a medicine man is. For he can be many things—a *pejuta wićaśa* who heals with herbs, a *yuwipi* who finds power in rawhide and stones, a *waayate* who sees into the future, a *wapiya* who conjures and a *heyoka* who is a sacred clown. The *wićaśa wakan,* says Lame Deer, goes beyond all of these. He is a holy man who can cure, prophesy, commune with stones and herbs, conduct the sun dance and possibly even change the weather.

But all these are only stages on the road to a great vision. The *wićaśa wakan* seeks solitude where he can meditate and feel the earth move and talk to the plants and hear their answers. As Lame Deer says, something flows into him and something from him, and what he sees with his eyes closed is what matters.

All this is pretty hard for whites to swallow when they're trying to make sense out of my friend for the sake of public relations. In New York, for example, at the beginning of our trip, Lame Deer asked to be taken to the ocean. He put on full regalia and waded into the surf up to his knees. He stood thus for a long time. "There is a power down there, a big power," he said finally. "This ocean has a language of its own. I have to learn to understand it."

He then demanded that I bring our publishers, Simon and Schuster, to him right then and there.

"John," I said, "I think Mr. Simon and Mr. Schuster are dead." This made him very suspicious. "Who runs the outfit now?" he wanted to know.

"A certain Mr. Shimkin, I believe."

"Get him here."

I explained that I just couldn't do that on a moment's notice. Even if I could reach him, I pointed out, I doubted whether he'd drop everything to join us in the surf on an icy morning.

"Too bad for him," John grumbled. "He's missing out on something big."

He then carefully selected four shells from the thousands on the beach. "Good medicine," he said. When we were warm and dry again, I asked him what he had learned. "I don't know yet," he said. "It could take a year for me to figure it out. Maybe it will come to me in a dream."

From shack to fancy hotel

Lame Deer was worried because the publisher had put us into only the best and most expensive hotels. He and his wife Ida live in a small wooden shack with a privy in the backyard. "Why don't they put us in cheap little motels and give us all that money instead of paying it to these fancy places?" he asked me.

"I guess they'd lose face if big-time reporters interviewed us in cheap motels."

"That's a lot of bull." End of discussion.

Sometimes the interviewers hadn't read our book and so couldn't get the dialogue going. Sometimes they'd done their homework, but with indifferent re-

Writer-photographer-artist Erdoes, who calls himself a "paleface Viennese Sioux," is coauthor, with the medicine man, of Lame Deer—Seeker of Visions. *He recently wrote about the troubles at Wounded Knee in which some of Lame Deer's tribe took part.*

Lame Deer says that the peace pipe is the Sioux' sacred symbol; its smoke is the Great Spirit's breath.

sults. One man plies us with questions about the sun dance, but he'd gained all his knowledge from the movie, *A Man Called Horse:* "The Sioux sun dance takes place inside an earth lodge, and the dancer is suspended from the ceiling by means of a rope which is passed through the flesh of his chest. Right?"

"Not right," we correct him. "In the movie they depict a Mandan ceremony as painted by Catlin [SMITHSONIAN, May 1972]. The Sioux sun dance is under open sky around the sacred pole—a forked cottonwood, draped with streamers and tobacco bundles which represent prayer offerings."

"At any rate," continues the interviewer, "the dancers stick wooden skewers through the flesh of their chests. Ropes are tied to the skewers and the dancer has to tear himself free to prove his courage and to initiate a boy into manhood. Right?"

"Not right. The piercing is done according to a vow. By his suffering, the dancer believes, he can help cure a sick relative. One man underwent piercing because he believed it could bring his son home from the war in Vietnam."

"Well, they do pierce, don't they?"

"Yes," says Lame Deer. "I have pierced lots of dancers. I do it so fast they hardly feel it. I use this little knife here."

The interviewer runs his thumb over the sharp blade and shudders.

"How about peyote? Is that part of your religion?" a lady asks.

"I tried it for a while," says John. "I tried almost everything having to do with Indian religion. But peyote isn't the Sioux way. It's an import from the southern tribes. I ate those 'buttons,' and they whirled me around all right and gave me visions. But even a butcher boy could have had visions by taking them. It's not our way.

"A real vision should hit you hard," John continues. "It should come out of your own juices and hit like a thunderbolt. You have to work for it. You go on a *hanblechia,* a vision quest. You stay in a hole, a vision pit, for four days and nights, naked, without food or water, listening to the wind, the tree branches, the owls. When you get a vision that way, you know it's the real thing."

Very often he was asked about the *yuwipi* cult. "*Yuwipi* has a double meaning," he would say. "The word can mean the tiny, white, glassy stones that ants put on their antheaps. These stones are sacred. You put them in a gourd, 405 of them—one for every plant and tree that we Sioux know. You shake this rattle, and what you are hearing is the voice of the spirit.

"*Yuwipi* also means to bind, to tie up. So during a *yuwipi* ceremony the medicine man is tied up and wrapped in a "star" blanket like a mummy and bound with rawhide thongs. Then the kerosene lamps are ex-

Eyes toward the sun, blowing an eagle bone whistle, sun dancers are pierced by medicine man for insertion

of skewers—sometimes an eagle claw—which they then tear loose, enduring pain in order to fulfill a vow.

Sioux sun dancer is lost in the religious symbolism of this oldest ritual. It used to last four days.

Medicine man is bound with rawhide for *yuwipi* ceremony, an ancient rite for invoking spiritual help.

He is wrapped like a mummy in a "star" blanket and tied with a rawhide thong. The lamps are doused.

tinguished and everybody sits in the dark. Little sparks of light flash through the air, and little voices whisper in your ears. These are the spirits coming in. They tell the medicine man what to do."

A listener turned to me: "You are a white man, a skeptical New Yorker. Do you believe all this? Have you taken part in these ceremonies?"

"I have heard the voices," I say, "and I have seen the lights, in a house with no electricity. The sparks were moving all around me and high on the ceiling where no man could reach them. And once an eagle came into the room. Nobody could see it, but everybody knew it was there. I could hear its high-pitched cries and feel the touch of its wings. And during a sun dance, in full daylight, I saw a medicine man make a circular motion over his head with a large feather, asking an eagle to come and circle the sacred pole. And within minutes a black dot appeared in the west, out of the clouds, and became a huge dark brown eagle. It circled slowly and silently four times above us, then sailed away without moving its wings. I and all the Indians saw this thing."

"And what's your explanation?"

"I have no explanation," I said.

If John didn't like a question, he would wave his arm imperiously in my direction: "Let my white friend answer this one. He likes to talk, too." He hated terms like acculturation, empathy, environmental ecology, anthropomorphic God-image, Gestalt therapy. I never had a chance to develop stage fright, being too busy worrying about John's unpredictability, holding myself ever ready to jump in when he clammed up.

In Philadelphia a psychologist who had studied shamanism in New Guinea asked John what part psychology plays among Sioux medicine men. John waved his arm at me, and I answered that some Sioux *yuwipi* ceremonies are a little like psychologists' encounter groups. Everyone has to speak up, taking his turn talking about his problems. The fact that this takes place in absolute, velvety darkness gives such a meeting a special intensity.

The Sioux have their own form of psychodrama. If a Sioux dreams of thunder and lightning, he becomes a *heyoka,* an upside-down man who has to pretend that he is cold when he is not, who has to say "yes" when he means "no." It can be trying to be a *heyoka* for any length of time. And in order to stop being one, the dreamer must put his bare arm into a pot of boil-

He lies as though dead while songs are sung. Finally the spirits come—tiny sparks and feather touches.

ing dog meat and fish out the dog's head. It is said that the arm is never burned.

The psychologists asked me if I take the work of Indian medicine men seriously. I pointed out that even the U.S. Health Service does—that last year thousands of dollars were designated to finance cooperation between Navajo medicine men and white doctors.

In Chicago, when John was asked his opinion of anthropologists, he took up the answer himself. "When I was a young man, way back, I 'borrowed' two or three cars from white men and wrecked them, all in one weekend. I was on a big spree—the best red-eye I ever drank. They put me in the reformatory for that, for nine long months. In that place they taught me English, they taught me to curse and they taught me sign-painting.

"Many years later I was at home in Winner, South Dakota, painting a sign for a grocery store. I had mislaid my brush. So I grabbed an old stick and tied some hair from a rabbit skin to it. I was about to use it when this anthropologist walked in: 'What kind of artifact is this? I have never seen anything like it!'

" 'This is the hair of General Custer,' I said. 'My grandfather brought it back from the Little Bighorn.'

"That anthropologist waved a big wad of green frogskins at me: 'I will give you 100 dollars for it,' he said. And he went away happy with his tuft of rabbit hair. I was happy too."

"Who killed Custer?" John was later asked. And he exploded a small bombshell by replying that no Indian killed him, for he was shot by his own men. "In all that dust one of his men might have mistaken him for an Indian. He wore buckskin that day. Or maybe his soldiers did it on purpose. They didn't like him much. Maybe he was fragged."

We once shared the spotlight with Father Peter J. Powell who wrote *Sweet Medicine,* a fine book about the Cheyenne religion. Father Powell told Lame Deer that he had been adopted into the Cheyenne tribe, had taken part in sun dances, fasted for a vision and sacrificed to the Great Spirit.

"What does your bishop say to all that?" asked John.

"It is one God," said Powell, "whether we call him *Deus,* Jehovah or *Wakan Tanka,* the Great Spirit."

"But it is not quite the same," said the Indian. "Can animals go into your heaven? Do you believe that animals and plants are our relatives, and that they have a soul?"

Father Powell winced. "Touché," he said.

"It's all right," John said. "We won't tell your bishop." We went off to a nearby cafeteria to talk and take each other's pictures.

In San Francisco the heel of one of John's cowboy boots has to be fixed. He decides also to get a shine, sitting in an old-style shoeshine parlor. Later, as we are signing copies of our book in a bookstore, the kid who had shined John's boots comes in and plunks down $7.95 for an autographed copy.

"Wait until we come out in paperback," I tell the boy. "Save your money."

"Don't listen to him," John cuts in. "My friend is a poor businessman."

Near Long Beach, overlooking the smog-covered Pacific, John's son Archie honors us with a powwow—dances and plenty of meat soup and fry-bread. Archie is six feet five and used to be a Hollywood stunt man. He used to be a heavy drinker and has done time. He is now a social worker, rehabilitating Indian prisoners and working to keep them out of prison in the first place. "I had on-the-job training," Archie told the judge when he asked for the job.

With Archie we join a group of Indian singers and dancers who will perform for the inmates of San Luis Obispo prison. We find ourselves in what looks like an auditorium filled with high school students. These are the inmates. John talks with a small, skinny, earnest kid. "Missionaries put me in a foster home," he tells John. "I don't even know what my tribe is. Tell me about Indian ways."

John takes him aside and talks to him for a long time, putting his hand on his head as if he were blessing him.

I think of a young Sioux I know whose family was preparing a giveaway feast. He went to the trading post for enough bread, meat and coffee to feed 50 or 60 people. "We'll pay you when we get the lease money in two months," he told the trader.

"You'll pay me now," said the trader, who was a new man in the area.

"You know I can't pay you now," said the Sioux. "The trader before you always gave us credit."

"He went broke," said the trader.

"This is a religious ceremony," said the Sioux. "I'll have to take the stuff, whether you like it or not. Watch what I take and write it down. I'll pay you when I can." And the Indian took what he needed and loaded it onto his old pickup.

The trader called the police, and now my young friend is doing time for robbery. He can't understand. Neither can his family.

"We used to get along fine for 25,000 years without laws and lawyers, taxis, banks, bars, whorehouses, pawnshops, insane asylums and, especially, prisons," says Lame Deer later that night, after we had left the prison. We are looking out at the Pacific in the moonlight. The smog is hidden in the darkness, and the silvery breakers look beautiful.

"Those men inside that jail, maybe they are free and we are prisoners," Lame Deer says. "The Great Spirit is good and bad, both. A medicine man has to be good and bad to understand. Listen to the owls, my friend, to the ants, to the little herbs. They know."

Naked Sioux undergoes purification in the *inipi,* or sweat bath, a ritual that precedes other ceremonies.

Indian children are brought up to take part in many of the ancient healing and religious rites.

By Catherine Lynn Frangiamore

A half-century of decorative arts

Furniture and pottery highlight a lavish show of turn-of-the-century American arts and crafts, soon at the Renwick Gallery

The harshly disapproving tones of an older woman rose above the hum of a Sunday afternoon museum crowd: "My goodness, why have they dragged out all this artsy-craftsy mission furniture?" Her husband seemed to be looking around with nostalgic eagerness as she hurried him straight through the exhibition.

They crossed the path of a gangly teen-ager in tennis shoes who, after three long strides across the gallery, wheeled to a sudden halt and stopped his friend: "Hey, man, here's some modern stuff I wanna look at!" With apparent enthusiasm they lingered to examine the show, repeatedly surprised by labels dating pieces to the turn of the century.

The provocation for such contrasting reactions is a spectacular show, "The Arts and Crafts Movement in America, 1876-1916," with approximately 300 examples of furniture, ceramics, glass, leatherwork, metalwork, architectural ornaments and printed books borrowed from museums and collectors across the country. (The exhibition, which was recently on view at the Art Institute of Chicago, originated at the Princeton University Art Museum and is scheduled to open at the Smithsonian Institution's Renwick Gallery in Washington on June 1.)

The American arts and crafts movement focused attention on handcraftsmanship, respect for materials, and simple, self-evident construction techniques in the design of objects made for everyday use. Most of the products were made outside the industrial system by people trying to improve on the quality of commercial, machine-made wares. Never a nationally unified movement, its many participants were scattered all across the country, although linked by a network of societies and publications.

They did not all work within a single, standardized style. The American arts and crafts movement drew from a number of stylistic sources—medieval, Japanese, American Indian and French Art Nouveau. But American craftsmen received much of their inspiration from English theorists.

As early as 1850, English theorists and designers,

Frank Lloyd Wright custom-designed this furniture in 1908 for a Chicago house. On the wall are

Mrs. Frangiamore is an assistant curator at the Smithsonian's Cooper-Hewitt Museum in New York.

two of Wright's leaded-glass windows and a
thistle-patterned portiere designed by Maher and Millet.

analyzing the Industrial Revolution, had focused on the principle of division of labor as the cause of many ills, both social and artistic. The division of labor had separated designers and fabricators into two exclusive groups. Artists were removed from the actual production of everyday objects, and therefore developed no understanding of the nature of the materials used. Consequently, they were rendered incapable of providing designs appropriate for those materials.

The central figure and catalyst of the English arts and crafts movement was William Morris—poet, scholar, painter, designer, craftsman and social reformer, who had a crusader's zeal for spreading the gospel of the dignity and joy of work, inseparable from the creation of art. Morris hoped to share art with the many, not by providing cheap products, but by educating the workingman, freeing him from the machine and reinstating him in a role similar to that of the medieval artist-craftsman.

Americans looked to Morris, as well as to other English critics, for inspiration. Some Americans copied English designs, some accepted theories and modeled workshops on English examples, and some took English ideas and went beyond them. Most notable of these last was the architect Frank Lloyd Wright, who is represented in the show by furniture, leaded-glass windows and even a section of iron entrance gate.

In Wright's work, architecture, ornamentation and

Photographs by Yale Joel

Grueby pottery, often decorated with modeled leaves in low relief, helped popularize mat glazes.

furnishings were all conceived as parts of a whole. For instance, the oak table and chairs (pages 38-39) were designed in 1908 for the dining room of Wright's Robie House in Chicago. Like much of his architecture, the dining-room set is boldly rectilinear, with high-backed chairs and massive table legs that also function as lamps. Wright admitted that he found it "difficult" to design furniture "as architecture and make it human at the same time—fit for human use. I have been black and blue in some spot, somewhere, almost all my life from too intimate contact with my own early furniture."

The most representative of American arts and crafts furniture designs are the "Craftsman" pieces of Gustav Stickley, who in 1898 formed his own company near Syracuse, New York, where he produced simple, rectilinear furniture. Stickley also involved himself in the publication of a monthly magazine called *The Craftsman,* which became an important vehicle for disseminating ideas on art and architecture—and helped establish the popularity of his own furniture. The very first issue of *The Craftsman,* published in 1901, proclaimed Stickley's endeavor "to promote and to extend the principles established by Morris, in both the artistic and socialistic sense."

Though proclaiming his discipleship of Morris, Stickley's aims were very different. Morris had not tried to provide goods for a mass public. Stickley did. Stickley's venture enjoyed considerable success—there were Craftsman furniture franchises from Boston to Los Angeles—until financial overextension brought about bankruptcy in 1915.

In addition to such large workshops as Stickley's, there were many smaller operations, like that of Charles Rohlfs, an actor-turned-craftsman in Buffalo, New York, who designed the "fancy chair" (opposite, at left) about 1898 for the living room of his own home. The carved oak chair is an unusually flamboyant example of scrollwork in the Art Nouveau style. A more sober-looking oak side chair (opposite, at right) was produced for a Chicago house by the Prairie School architect, George Grant Elmslie, who for a time was chief designer for the architectural firm of Adler and Sullivan. Its distinguishing feature is the severe, geometric design of the tapering splat.

Socially prominent ladies in Cincinnati were among the vanguard of American artist-craftsmen. Their interest started tamely enough in 1872 with a pastime popular among English ladies "going in" for art: a class in china-painting at the local art school. For some, this class marked the beginning of a transformation from dilettantes to skilled craftswomen. In 1880 one member of the class, Maria Longworth Nichols, founded the first successful art pottery in America, the Rookwood Pottery, which became celebrated for its glazes and finely painted decorations. Mrs. Nichols named it "Rookwood" after her family estate and also because "it reminded one of Wedgwood."

The so-called art potteries dotted the map of the United States between 1876 and 1916, and 140 examples of their products are featured in the current show. In the Boston pottery of William H. Grueby, founded in the 1890s, handcraftsmanship was emphasized. Each vase (above) was hand-thrown and hand-decorated by modeling, painting and glazing. Mat or flat, non-shiny glazes—usually in a shade of green that has been lik-

These vases were made around the turn of the century in William H. Grueby's Boston workshop.

ened to watermelon rind—were introduced by Grueby around 1898. His wares brought a new look to American art pottery. By 1900 kilns across the nation were producing mat glazes.

Probably the most famous of American artists who turned to the crafts was Louis C. Tiffany, who attained international recognition for his iridescent glasswares, which are brilliant examples of the Art Nouveau style. Regarding himself primarily as a colorist, he excelled in designing ornate glass windows. He drew his inspiration from nature, but could not resist heightening nature's colors. For the center panel (at right, top) of a three-part leaded-glass window, made for a New Jersey house after 1910, he composed a lush landscape with cypresses, flowering trees, iris, a brook and a florid sunset. Myriad bits of brilliantly colored glass—some mottled, some marbleized, some superimposed—have been brought together in an exuberant celebration of the possibilities of the medium.

The role of the arts and crafts movement as a major influence on popular taste ended with World War I. Fashionable whim and the impossibility of keeping down the cost of handcrafted goods worked against it. However, the movement had far-reaching influence in spreading not only the idea, but also the practice, of applying moral and social criteria to the processes of design and production of everyday objects. In spreading the gospel of simplicity, it provided an important precedent for today's modernists.

This 50-inch-high glass panel is the center of a three-part window designed by Louis C. Tiffany.

Two extremes in plain and fancy chairs: Rohlfs' frenzied curves and Elmslie's harsh angularity.

By Glenn M. Loney

Cross-country with Shakespeare

How one theater buff found the Bard to be a summer festival with his great plays performed all over North America

On Broadway, there's nothing very unusual about two Neil Simon comedies running simultaneously. But two comedies by William Shakespeare? That is unusual. Yet, in the 1972-73 season, there they were! At the St. James, *Two Gentlemen of Verona,* and at the Winter Garden, *Much Ado About Nothing.*

True, both productions had been considerably jazzed up. Shakespeare's plots and characters had been pushed and shoved into the 20th century. Then the music of the Bard's own words was wedded with more modern musical idioms. No matter: Not only do these updated versions of Elizabethan classics preserve the original outlines and language, they are also good box office, thanks to the talent and effort invested in the productions by Joseph Papp, founder and guiding force of the New York Shakespeare Festival.

But New York is definitely not the only place in North America where Shakespeare is good box office. Every summer, throughout the United States and Canada, Shakespeare festivals are a major tourist attraction in a number of cities and towns.

Last summer I decided to visit as many of these festivals as I could. The impetus for my marathon trip was my curiosity about the number of festivals. Why were there so many? And how good were they?

My journeys took me from coast to coast. Maine, I discovered, is rightly proud of her Shakespeare festival in Monmouth. In Burlington, Vermont, there is the Champlain Shakespeare Festival. On or near the Pacific, there are three Bardic festivals: The Oregon Shakespearean Festival, in Ashland; the Marin Shakespeare Festival, in San Rafael near San Francisco, and the San Diego National Shakespeare Festival.

If East and West are represented, so are North and South. The Great Lakes Shakespeare Festival is held in Lakewood, a suburb of Cleveland. In the South, Odessa, Texas, is the home of The Globe of the Great Southwest. The nation's capital has a festival every summer in the open-air Sylvan Theatre. During the regular theater season, a Shakespearean production is always part of the program of plays in the Elizabethan theater of the Folger Shakespeare Library on Capitol Hill. In September, the Kennedy Center will start its third season with "Shakespeare and the Performing Arts," a month-long festival of drama, opera, ballet, concerts and films.

New Jersey offers two summer festivals. In Madison, one can visit the New Jersey Shakespeare Festival. In Woodbridge, the attraction is the New Jersey Shakespeare Festival of Woodbridge, to avoid confusion. Other Shakespeare festivals and summer workshops are to be found at the University of Kansas in Lawrence and Wisconsin State University at Superior.

The American Shakespeare Theatre, based in Stratford, Connecticut, is a major professional undertaking. It plays to school audiences during the spring and to tourists and other Shakespeare buffs in the summer. It is sometimes confused with its sister, the Stratford Festival of Canada, located in Stratford, Ontario. So, if one is asked to go to Stratford for some Shakespeare, it is always wise to ask which one.

Altogether, there are about 20 summer Shakespeare festivals scattered in both obvious and unlikely places around the North American continent.

Drama needs a comic antidote

One might well ask why there are so many Shakespeare festivals and no festivals at all to honor such American playwrights as Eugene O'Neill, Tennessee Williams or Arthur Miller.

Answers are that if a festival is to be an annual affair, it should not repeat plays too often. Miller and Williams do not have nearly as large a body of dramas as Shakespeare. O'Neill was nearly as prodigious a playwright as Shakespeare, but even O'Neill's most devoted admirers cannot claim that all the works are classics. There is another problem, too. Festival managers like to balance the serious with the comic. O'Neill's only major comedy was *Ah, Wilderness!* It would rapidly lose its comic effect if it were repeated

Glenn M. Loney is a theater professor at the City University of New York in Brooklyn and a contributing editor to Theatre Crafts.

A mime entertains diners on opening day of the
Marin Shakespeare Festival in San Rafael, California.

The San Diego National Shakespeare Festival is held in the Old Globe Theatre, based on English models.

A major undertaking is the American Shakespeare

every summer as the sole antidote to such somber dramas as *Desire Under the Elms, Mourning Becomes Electra* and *Long Day's Journey into Night.*

Shakespeare's plays offer a wider variety of types and themes than are to be found in the works of any other playwright. Not to imitate Polonius' catalog of "pastoral-comical, historical-pastoral, tragical-historical," but the Bard of Stratford's skill at mixing serious elements into his comedies and lightening his tragedies with farcical touches is widely known. Not only do the plays offer variety, they also contain stories and characters which have never lost their power to fascinate. The beauties of Shakespeare's language are beyond dispute. And, if there are hordes of actors dying for the chance to speak that language on stage, there are apparently even larger groups eager to go to the theater and hear it.

Hearing of my projected circuit, several friends tried to dissuade me. "A little Shakespeare," said one, "can go a long way." When I was seeing my *fourth* production of *The Merry Wives of Windsor* in as many weeks, I had to admit that you can have too much of a good thing.

Obviously, attending every Shakespeare festival is not oppressively arduous. In the course of my travels, I learned a lot, not all of it about Shakespeare or production problems.

First, and perhaps most important to other would-be Shakespeare pilgrims, is that getting around to the festivals is difficult. Despite all the pious talk about efficient, up-to-date mass transit systems, most parts of the United States and Canada are geared to automobile owners. But if one is determined to hop around the continent, sampling *Antony and Cleopatra* in Colorado and *The Taming of the Shrew* in New Jersey, it can be done.

Although it is possible to arrive on a performance day without a reserved ticket, that isn't good planning. Odessa and Burlington may seem remote places to some out-of-towners. But that doesn't mean that both the local citizenry and enterprising tourists haven't bought every ticket in sight. In fact, that is often just what happens. In the 1960s, for instance, many Californians liked to take a leisurely drive up the Pacific Coast to spend a day or two at the Oregon Shakespearean Festival in Ashland. The large number of seats in its open-air Elizabethan Theatre and the fact that four plays were performed in rotation seven days a week all summer long usually guaranteed there would be unsold tickets at the box office right up to curtain time. The Ashland festival became so popular, however, that numbers of tourists were arriving without tickets—and with no prospect of obtaining any.

To take care of this overflow and to avoid disappointing even those who don't plan ahead, Ashland has built a handsome new indoor theater. Now there are six plays—by Shakespeare and modern playwrights—available in the two theaters in a three-day rotation. San Diego is also fortunate in having a second stage to absorb some of its spectator surplus.

Those Americans and Canadians who take to the roads as often as possible don't have to be reminded how varied and interesting the land is. But there is a lot more to the many local scenes. In planning to visit

Theatre, founded in 1955 in Stratford, Connecticut.

The Oregon Shakespearean Festival in Ashland has an outdoor Elizabethan Theatre, founded in 1935.

Cedar City and the Utah Shakespeare Festival, for example, I was so intent on how to get there, which days I would schedule for the visit, and what plays I wanted to see, that I didn't bother to pay any attention to what I could do during the daytime.

Flying into Cedar City gave me a jolt. I suddenly realized I was about to be plunked down in the midst of some of America's most monumental scenery. Vistas of the Grand Canyon and Lake Powell from the air were nothing compared to being in Cedar Breaks National Monument, Zion and Bryce Canyon National Parks! I had come to admire the genius of Shakespeare and ended up by also being overwhelmed with the genius of Nature. Of this reaction, Professor Fred C. Adams, producing director of the Utah festival, says, "When we began, we thought the festival might be something for tourists to Bryce and Zion to do in the evening. Now, just as you have done, people come for the Shakespeare and get the National Parks as a bonus."

Every one of the festivals is near some natural or man-made object of interest. In Texas, Odessa proudly claims the world's largest jackrabbits. The one tourists can see most easily is a large plaster model (page 46) in the midst of downtown Odessa. There's no telling how large the jackrabbits are which are seen by those who have imbibed liberally of bourbon and Texas branch water, however.

Thus, a summer Shakespeare tour has the added advantage of helping people to know their own country better. If they have been worn down by the rudeness and rush of the big cities, they might want to try Shakespeare in Cedar City instead of in Central Park.

On the East Coast, the professionalism and performance standards of the festivals in New York and at the two Stratfords are well known. They have been duly celebrated—and described by Clive Barnes, Walter Kerr and Henry Hewes, among other leading critics. But Easterners, unfamiliar with Ashland, uncertain about making a trip to San Diego, may want to know: "Is it any good? Can they possibly do professional work out there?"

To apply Broadway standards to regional summer theater productions is both unfair and a bit unrealistic. The circumstances and finances are usually so very different. Not to mention the goals of the festivals and the audiences' expectations. If the satisfaction of audience expectations were the sole critical criterion, then most festivals would get at least three stars, some of them, four.

I believe it is also necessary to consider the level of training of the performers: Are they experienced? Equity-card holders? Or are they college students, trying to learn something about both art and life by performing Shakespeare's plays? How much rehearsal time has there been? What kind of facilities do they have? Are the performers paid—if so, how much? How much subsidy supports the festivals? It may be possible for some to look at any production, with no regard for such variables, and make a judgment on its value. Anyone who knows how expensive, difficult and time-consuming it is to create even a passable theater production will want to take such factors into account.

But, that being said, I'm impressed with the caliber

The Taming of the Shrew received an exuberant production at last year's Ashland, Oregon, festival.

of work being done at Ashland, both with Elizabethan and modern classics, even though there are some novices in the company and even though it does not perform as an ensemble all year round. Its leading players are not the stars one customarily sees at the two Stratfords or in New York, but they are well trained, attractive and talented. San Diego boasts a professional troupe and has mounted some fine Shakespeare, but the work seemed weaker last year than it had in earlier seasons. Considering the fact that there are only ten days allowed for the rehearsal and construction of each of its summer shows, the Great Lakes Festival does very well to give a professional gloss to five different productions.

Those festivals which lack the subsidy or the seating capacity to generate enough money to employ large numbers of professionals often make up for such lacks with the ingenuity of their productions. And with their infectious enthusiasm. At Odessa, for instance, a Wild West version of *Taming of the Shrew* was great fun and made much more sense than setting *Much Ado* in the United States at the close of the Spanish-American War, as one New York director did. To a purist, it might be painful to hear such names as No Trees and Big Spring replacing ones like Mantua and Padua. The Texans loved it, and so did I.

No one knows with any certainty just what Shakespeare's Globe Theatre looked like. Scholars have theories, however, and reconstructions have been made on the basis of these educated guesses. As a result, San Diego has its festival in an "Old Globe" theater. Odessa's Globe Theatre is described by local publicity as the "most authentic replica." Ashland has been more careful; it has an "Elizabethan" theater, making no stronger claims to authenticity than that.

It is interesting, considering that Shakespeare never visited the Americas, how many New World copies there are of his Globe Theatre. Yet the Shakespeare Memorial Theatre at Stratford-on-Avon is in no sense an attempt to conjure up the old Globe Theatre. All these American imitations have finally had an impact on the British. Plans are going forward to reconstruct the Globe on or near its original location in London's Southwark. And, not far from the Sadler's Wells Theatre, a church has been turned into a quasi-Globe for Shakespearean plays.

The typical Elizabethan stage had several levels and areas for action, which allowed the many scenes of dramas, such as *Hamlet* and *Macbeth,* to be played swiftly, with little or no scenery to slow down the performances. Modern reconstructions are far more flexible for multiscened dramas than the conventional

This sculpture is an added attraction for playgoers at The Globe of the Great Southwest.

Members of the Marin Shakespeare Festival show off costumes from their production of *Twelfth Night*.

proscenium-arch playhouses. As a result, when festivals use the picture-frame theater stage, designers often provide the areas and levels inside the arch. Shakespeare's Globe was open to the elements. San Diego's and Odessa's are not. The theaters are needed for year-round performances, so such "authenticity" as getting rained on had to be given up. Utah's Globe is open, but is used only in summer. Ashland, Boulder, Marin, New York, Washington and one or two others are also open-air theaters. Even in summer, sudden storms can be a hazard. But that is part of the adventure of festival-making and festival-going.

Many festivals have pre-performance entertainments and side-shows to get the audiences in the mood. Elizabethan songs and dances are a feature at San Diego, Ashland and Cedar City, for example. Marin has a charming puppet theater. At Ashland, there are often daytime performances of medieval dramas on a pageant-wagon in Lithia Park, below the theater complex. And, just before being delighted with the beauties of *Love's Labour's Lost,* Ashland audiences are regaled with Punch-and-Judy or magic shows in the courtyard outside the Elizabethan theater. On the opening day of the Marin festival season, a hearty barbecue is served, with various Tudor treats. While the guests eat and get acquainted, mimes stroll about, imitating Elizabethan table manners. Anyone who really loves theater will find it hard to resist the enthusiasm of the Cedar City ladies who don Elizabethan costumes in the scorching afternoon sun, in order to complement their own Globe Theatre, as they show people to their seats or sell horehound candy and cakes made from old Tudor recipes.

Still, the play *is* the thing. Last summer no fewer than 20 of Shakespeare's plays were on view at various festivals. *The Merry Wives of Windsor* won the sweepstakes with four productions. But *Romeo and Juliet, Richard III, Hamlet, Twelfth Night, Taming of the Shrew* and *Troilus and Cressida* were close behind, with three productions each. *Troilus* is seldom produced, making the number of stagings even more impressive. Other less frequently mounted works were *Antony and Cleopatra* (Colorado and Connecticut), *The Winter's Tale* (Colorado and Utah), *Love's Labour's Lost* (Oregon and San Diego, California). The rarely seen *Titus Andronicus* was offered in Burlington, while Monmouth's tiny stage seemed to expand with a sensitive performance of *Richard II.*

Despite the unevenness in quality among the festivals—largely owing to financial and time limitations—interest and enthusiasm often help fill the gaps in professionalism. Frequently the audiences bring as much of both virtues to the performances as the performers do. It is worth noting that for many festival visitors each year, the play or plays they see constitute their first experience of seeing Shakespeare on stage. For a number of them, revisiting summer Shakespeare festivals becomes a pleasant addiction.

More important to the future of the American theater, several festivals have attracted such loyal audiences that they have been able to offer winter or spring seasons, as at Ashland and Stratford, Connecticut, or offer virtually year-round productions of dramas, as at San Diego and Odessa. If professional regional theater is to take firm root, then these summer Shakespeare festivals may prove to be prophetic.

A professional cast performed *Troilus and Cressida* at the Sylvan Theatre in Washington, D.C.

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How to get the for your money.

Buying stereo can be confusing.

One friend says you have to spend a mint. Another tells you about a "special" bargain on a foreign-made set. And overly enthusiastic salesmen might just confuse you with all kinds of technical specs.

Well, fact is you do have to know a little bit about stereo to make sure you're getting the most music for your money. But you don't have to be an engineer. Or even a buff. Just an intelligent shopper armed with a few basic facts.

So here they are.

Start with the Receiver

A good music system starts with a good stereo receiver. (A stereo receiver is a combination of a stereo amplifier and AM/FM/FM stereo tuner.) So that's a logical place to begin your buying.

But picking the right receiver is no picnic. Because receivers by themselves don't do a thing you can see or hear. They just receive tiny sound impulses from a record, tape, or radio station, magnify them millions of times, with as little distortion as possible, and drive the speakers with the magnified impulse.

All of which means that two of the most important things to look for in receivers are how much distortion takes place and how much power there is to drive the speakers.

Distortion ratings (called T.H.D.) are simple. The lower the number the better. For example, Sylvania receivers CR2742 and CR2743 both have a rating of 0.5% at full power output, which is considered good.

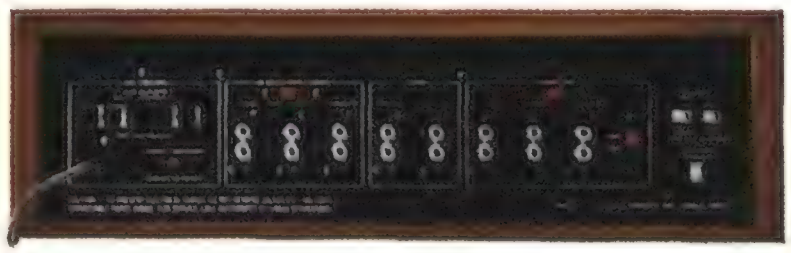
Power is a bit more complicated. There are several kinds of ratings. But the one that counts is the "continuous" or RMS rating. Here the higher the number, the more power you have to drive speakers. A receiver like the Sylvania CR2742, with a continuous power rating of 25 watts per channel, can easily drive four big speakers. If you want an even larger system, with speakers all over the house, the Sylvania CR2743 can handle them with a continuous power rating of 50 watts per channel. If you can't get a continuous power rating, be suspicious!

The next things to check are the features. A good stereo receiver should have solid-state circuitry, Field Effect Transistors (FET's), and ceramic filters. We won't go into their technical functions here, but be sure to look for them while buying. Quality receivers will have them.

Your receiver should also have a full-function jack panel (like the one on the back of the Sylvania CR2743 shown below) that allows you to add extra speakers, tape decks, headphones, or other equipment. And make sure there's built-in capability to adapt the new quadraphonic sound systems in case you want to expand in that direction.

Every Sylvania receiver, for example, has built-in Phase Q4 matrix four-channel circuitry to enhance ordinary two-channel stereo. This gives the effect of four-channel sound. In addition, you can get true (discrete) four-channel sound simply by adding our special new DMQ2784W quadraphonic converter. (And of course in both cases you need two extra speakers.)

Finally, check the price. As a guide, the Sylvania CR2742 gives you 50 watts total continuous and all the rest for $199.95.* The CR2743 gives you all that and 100 watts total continuous for $279.95.* So no matter what brand you choose, make sure you get just as much for just as little.



most music

Onward to the Speakers

The technical stuff's out of the way. Now comes the fun part.

The only way to buy speakers is to listen to them. Compare the different sounds from the different sizes. Ask the salesman about "air" or "acoustic" suspension speakers. In general, they deliver the most satisfying speaker sound.

Make the salesman work a little. Switch back and forth between the big, medium, and small speakers. Play it by ear. The ones that sound best to you are the ones to buy.

Just keep your eyes out for a few things while your ears are busy. Make sure the receiver driving the speakers you're hearing is the same as the one you're buying. Otherwise you won't be getting the same sound once you get the speakers home and hooked up to your receiver.

And remember, the word "speaker" refers to two things. It means the individual speakers... woofers, tweeter, etc. But it also refers to the whole speaker cabinet, which generally contains more than one individual speaker. Be sure to check out how many speakers there are in any speaker cabinet. Two, a woofer for low notes and a tweeter for high ones, is a minimum. Bigger speakers, like the Sylvania AS125A, will have at least three: a woofer, a dome mid-range, and a dome tweeter.

Prices range from $149.95* for the big Sylvania AS125A with three speakers to a cabinet, down to $59.95* a pair for the Sylvania AS1706W with two speakers each.

But above all else, pick the speakers that sound best to you.

Now It's the Turntable's Turn

There are a few manufacturers who specialize in making turntable mechanisms. It's their thing, and their product is definitely superior.

The only trick to buying a turntable, then, is to make sure that you get one whose guts come from one of these specialists.

Any audio manufacturer should be more than happy to tell you who made his turntable mechanism. For example, Dual (one of the big names) made the changer in Sylvania's T2705 Automatic Turntable. Garrard (that's another big one) made the changer in our model T2703.

Ask for magnetic cartridges on your turntable. They're more sophisticated and pick up sound impulses better than ceramic cartridges. Both Sylvania turntables have them.

Things like cue-pause control (which allows you to gently raise and lower the tone arm to any band you choose) and anti-skate control (which equalizes pressure on both walls of a record groove to give less sound distortion) are usually standard on quality turntables like a Sylvania.

Price guidelines are $139.95* for the T2705 and $79.95* for the T2703.

E-x-p-a-n-d-i-n-g

Adding tape facilities is a simple way to expand your basic stereo system.

You can add a Cassette Play/Record Tape Deck like the Sylvania CT160 to play pre-recorded cassette tapes over your speaker system. Or you can record your own in two-channel stereo.

Or, you can go the 8-track route, with a Playback Deck like the Sylvania ET2750W. That way you can use car stereo tapes at home, and vice versa.

Good Luck!

By now you're a lot smarter about stereo. You know basically what to look for. And you've got some guidelines on what to pay.

So now's the time to go out shopping. Look around. Compare. Get the most music for your money.

And even if you don't pick a Sylvania, enjoy your stereo!

*Based on manufacturer's suggested list price.

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For the physical and emotional health of your children, EXXON CORPORATION urges you to read this article from TV Guide—then discuss the idea with your school officials.

CLASSROOM TV SHOW BANNED IN BOSTON

Not all instructional television is as dull as it used to be

On TV screens in thousands of classrooms this January, 8-to-10-year-old pupils will see a small drama about a little girl their age who loses her grandmother. Some of the action:

As relatives gather for the funeral, Linda and her cousins play in the family's front yard. One game is "Bang, bang, you're dead!" Linda gets "shot," falls to the ground and lies motionless a few moments, briefly alarming her playmates. Later her parents try to explain to her what it means to die. She asks them, "Are *you* going to die?" "Some day," her mother answers gravely. At the graveside, Linda hears the minister intone, "There is a time to live and a time to die."

Could be an episode of *As the World Turns*? Or *Edge of Night*?

Could be. But it's actually a 15-minute film produced by public-TV station KETC in St. Louis. It is part of a 30-episode educational TV series to be distributed in the U.S. and Canada by the National Instructional Television Center of Bloomington, Ind.

Classroom TV, often disparaged in academic and TV circles as a glittering promise that never got beyond mediocrity, is still around. It is, in fact, alive and well in many communities, and actually looking a little healthier.

It's a shoestring operation, to be sure, getting little aid from big government and philanthropic spenders, partly because Uncle Sam has never seen fit to make televised teaching a major funding beneficiary and partly because local school boards are too harried by rising educational costs to shell out much money for what seems to them a teaching frill.

Still, a few agencies like NIT are managing to crank out moderately successful contributions to a growing library of ETV materials. Founded in 1965 with Federal assistance, the center is now a self-supporting operation with nearly 700 hours of ETV programming available on a rental basis to the country's 210-or-so public-TV stations. Each year NIT assembles a consortium of underwriters to produce a new series of programs. The 31 participating sponsors include state departments of education, ETV networks and commissions, and Canada's Province of Ontario.

Costing a mere $600,000—roughly the amount a big commercial network spends for two runs of a prime-time movie—*Inside/Out*, as the forthcoming 30-episode series is called, is described by NIT as "the most extensive project ever undertaken in North American classroom television." (*Sesame Street* and *The Electric Company* are not in the same category because they are designed primarily for at-home rather than in-school viewing, although both are seen in many schools.)

Inside/Out is more ambitious than earlier NIT projects in several respects. Through little slice-of-life vignettes (such as one called "Must I/May I," picturing situations in which children struggle with their sense of responsibility), the programs will seek to provide a framework for classroom discussions of children's social, emotional and physical concerns. Months of research into schoolroom needs, according to Kent Owen, one of NIT's publications editors, found students and teachers "bored to death with blood and bones, things with no direct bearing on the children's lives," and crying out for ways to "feel through" children's inner feelings. *Inside/Out*, Owen believes, "is going to open up discussions in classrooms as they've never been opened up before. We're not dismissing the need for cognitive materials, but simply trying to deal with human feelings for a change."

The idea has brought educators running, the NIT official claims. "We didn't have to go out and twist arms on this one. The agencies and states came rushing in to participate." An unexpected windfall came from Exxon: a $200,000 grant to NIT to pay for printing and distribution of teacher guides and classroom aids.

Sample programs for the series have been field-tested in 10 localities, from Salem, Ore., and Fresno, Cal., to St. Louis, Chicago, Toronto and Boston. Altogether, 4000 children viewed five test shows.

The academic acceptance apparently has been exceptional. "We're flabbergasted at the enthusiastic response by the teachers," Owen reports. He admitted that some Boston schoolmarms had found the episode on death "inappropriate" and said they would not show it to their pupils. "Actually we're encouraged," the NIT man laughed, "to think we could produce something that would be 'banned in Boston'."

Assignments to produce shows for the series were parceled out by NIT to WNVT, the Northern Virginia Educational Television station in Annandale; WVIZ, the metropolitan Cleveland ETV station; the Kentucky Educational Television Network; St. Louis's KETC-TV; and the Ontario Educational Communications Authority. Dr. Orvis Harrelson, health-services director for the Tacoma, Wash., public schools, is serving as chief consultant.

The participating agencies have put up $450,000. NIT will try to get back the remaining $150,000 in fees from stations. Edwin Cohen, NIT's executive director, believes every public-TV station in the U.S. with daytime school service—a handful do not air such programming—will carry *Inside/Out*.

Is there some way NIT will have of gauging the classroom impact of the programs? "Oh, yes," Cohen reported. "The consortium members keep a close eye on how the programs are used in the classrooms and get back reports from teachers. You might say we have our own form of Nielsen ratings."

And NIT is confident, he implied, that *Inside/Out* is going to be ETV's 1973 hit show. (END)

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A half-inch-long poisonous frog, *Dendrobates pumilio,* suns itself fearlessly upon a leaf.

By M. Samuel Cannon

Beautiful, bold —and venomous

Some Latin American frogs are visual delights but they are a gourmet's nightmare. Also, watch out for toads

They have been called the Borgias of the amphibian world. Legend has it that sometime long ago the Indians of Central and South America learned to impale these diminutive frogs on sticks and slowly simmer them over hot coals, collecting the poison drops from the skin. The venom was fermented and coated on blowgun darts and, supposedly, it was so lethal that, when shot into an animal, it produced almost instantaneous paralysis, convulsions and respiratory failure.

These toxic skin secretions may have had less deadly uses. The Indians, it is said, used the venom from two frogs—a metallic black frog with splashes of green, *Dendrobates auratus,* and its relative *Dendrobates tinctorius*—to dye the feathers of parrots. The story goes that they pulled out the viridescent feathers and introduced the venom into the sockets: The new plumage would grow out yellow, blue or maroon.

Whether such jungle lore is true or not, the Dendro-

Photographs by Gabriel A. Palkuti

A voracious Colombian horned frog unwisely attempts to swallow a poisonous frog.

A second later, the poisonous frog, unharmed, is set free while the horned frog's mouth burns.

This inch-and-a-half South American amphibian, *Atelopus ignescens,* is neither dead nor is it feigning

bates do have toxic skin secretions at a higher level than most amphibians and they did not evolve as hunting aids and cosmetic material for the local tribal people, but more likely as a defense for the frogs. And except for whatever use may be made of them by the Indians, these small frogs appear to have no natural enemy. Indeed, it would seem to be to the frog's advantage to advertise, lest a potential predator mistake it for a more palatable species. For example, the brightly colored *Dendrobates pumilio* (see page 53) is often found sunning itself in plain view. On the other hand, this same species has been found in Panama to have a wide range of color that does not correlate with their variations in toxicity, raising some questions in the minds of biologists as to whether the bright colors of these frogs are warning signals after all.

These are forest-dwelling frogs, adapted to a far more terrestrial life than one associates with most frogs or, for that matter, with most amphibians which generally lay their eggs in water and spend much of their life near the water. Among Dendrobatids, the task of guarding the eggs often falls to the male. The eggs are laid on the ground and eventually hatch devoid of contact with any water except mist or dew. The tadpoles attach themselves to the male's back to be transported to jungle pools where they complete their metamorphosis, emerging about a year later as adults one or two inches long.

death. Instead it has arched over to expose its belly, warning off potential predators.

Such paternal instincts are less in evidence among another group of venomous amphibians known as Atelopids. For example, the males of *Atelopus stelzneri* abandon their eggs in temporary pools where they hatch after the remarkably short interval of 24 hours.

When frightened, some Atelopids contort their legs and head backward over the body, thus flaunting their gaudy bellies, presumably to warn predators of their noxious skin secretions. In our laboratory, *Atelopus ignescens* has often demonstrated this posture (see photograph above). The Atelopids, too, are relatively enemy-free and quite unlike the shy frogs one normally finds. The exotic Zetek's frog *(Atelopus zeteki),* also known as the Golden Frog of El Valle de Antón in Panama, is especially curious and bold and therefore especially easy to catch while it perches precariously on rocks in streams or on pendulous leaves.

These toxic frogs and toads may be easily approached and caught, but they are seldom seen in zoos. They are fragile, susceptible to a multitude of diseases and, like most other frogs and toads, they recognize their prey by its movements. Hence living food is required. We have successfully kept them by feeding them common fruit flies and by adding modest amounts of ozone to the atmosphere of their quarters. (Ozone, we have found, is an extremely valuable adjunct in raising all Anura.)

One need not go to such trouble or so far south to

see venomous amphibians. They exist in North America. After a rewarding evening gathering leopard frogs, it is not unusual for the tyro collector to open his bag and find that the only animal alive is an excitable brown-spotted frog he mistook for the more greenish leopard frog. This interloper is *Rana palustris,* the pickerel frog, so named because it is often used as bait in pickerel fishing. Found throughout the eastern United States and as far north as Hudson Bay, its entire skin emits an acerbic venom lethal to other frogs.

But the aristocrats of North American toxiferous amphibians are the true toads. *Bufo marinus* is a goliath among the true toads—it averages four to six inches in length—and it is found in all the Americas, particularly in Florida and Texas and throughout the Caribbean where it was imported years ago to take advantage of its appetite for the sugarcane beetle.

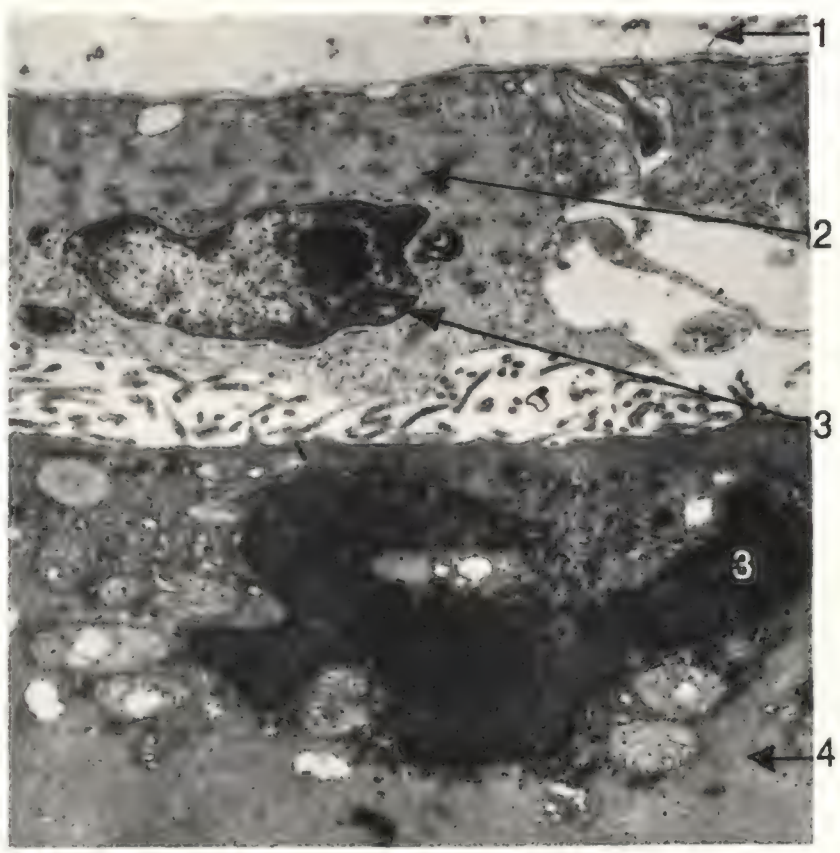
The swollen parotid glands on the head and shoulders that characterize all species of Bufo are enormous on *Bufo marinus* and, when touched, they secrete a viscous white venom composed of several classes of pharmacologically active compounds. Some have an effect like that of digitalis.

Slightly smaller than *Bufo marinus,* solitary and crepuscular with a greenish leathery skin and a white belly, the Colorado River toad *(Bufo alvarius)* inhabits California's Imperial Valley south into Sonora, Mexico. Curious white warts at the angle of the jaw prevent *Bufo alvarius* from being confused with any other true toad.

On dark evenings this giant toad sits beneath street lights in desert towns, gorging itself to bulbous proportions on insects. (It does the same in captivity; our specimens are more than seven years old and easily maintained.) In early spring it is found breeding in rain-drenched arroyos and cattle watering troughs. When held in the hand, it jerks spasmodically and exudes its creamy venom.

Despite their squat bodies and ineffectual leaps, *Bufo marinus* and *Bufo alvarius* have few predators. The uninitiated gourmet seeking to make a meal of them seldom errs twice. He gets an instantaneous burning of the oral membranes as the venom is absorbed, followed rapidly by general muscle paralysis and accelerated heart action and respiration.

The ancient Orientals knew the toxicity and the medicinal properties of toad venom. Even today, in pharmacies in larger cities such as Tokyo, the venom of several Chinese toad species is rolled into brown disks called Ch'an or Senso and used to restore strength. As is sometimes the case with folk medicines, the therapeutic effects may not be merely psychological, and that is sufficient reason to study these extraordinary creatures. Yet another reason is that so many of them, imbued with the colors of the rainbow, are a pleasure to see—if you handle them with care.



A section through the parotid gland of a venomous toad, *Bufo marinus,* is seen magnified more than 20,000 times by an electron microscope. Dark areas (3) are cell nuclei. Venom is produced in secretory cell layer (4) and may be forced by contractible cell layer (2) through connective tissue (1) to skin's surface.

Atelopus elegans is apparently dangerous to touch for all but another *Atelopus elegans.*

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Mr. Palkuti is director of photography at Ohio State University's department of anatomy.

By Russell Lynes

How the Museum of Modern Art survived the fire

Gone forever: Principal art casualty of the fire was Monet's 18½-foot-wide *Water Lilies.*

It could have been a major tragedy, and it still gives all museum men the shudders, but MOMA rose from its ashes stronger than ever

Shortly after noon on April 15, 1958, a trustee of the Museum of Modern Art in New York heard a news flash on the radio that the Museum was in trouble. He telephoned to find out what was going on.

"We're having a fire today, sir," the switchboard operator said. "Please call back tomorrow."

Daniel Catton Rich, director of the Art Institute of Chicago and one of the most highly regarded museum men of his day, was sitting in his office with his curators at just about this same time. He was holding a staff meeting. The door burst open without warning and Rich looked up to see the Institute's public relations head. She looked thunderstruck.

"Alfred Barr just called to say the Modern Museum's on fire," she said. "I thought you'd like to know."

Rich had just lent Georges Seurat's masterpiece, *La Grande Jatte,* to the Museum of Modern Art. Frederick Clay Bartlett, who paid $24,000 for it in 1924 and a few years later turned down an offer of $450,000 from a French syndicate, had given it to the Art Institute on the stipulation that it could be loaned only once to another institution, and it was insured on this occasion for $1 million. Rich called the Museum of Modern Art at once and got no answer.

"So I called the Dorset Hotel where I usually stayed in New York," he recalls. "It is just down the street from the Museum garden on 54th Street. The manager said, 'Yes, there are fire engines in the street. I'll go look.' He came back in a minute and said, 'Yes, the Museum does seem to be on fire.' "

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The Museum of Modern Art (Mrs. Simon Guggenheim Fund)

The great painting lay beneath the pile of water-soaked debris below. It was totally destroyed.

Rich and the Institute's conservator, Louis Pomerantz, were on a plane to New York within the hour and on 54th Street by midafternoon. "We got there after the fire was out," he remembers. "We could see through the windows of the Whitney [Museum of American Art, which in those days was located behind the Modern and was connected to it], where the pictures had been moved, and there was a large canvas about the size of the Seurat very badly damaged, but Pomerantz said, 'That's not it. That's the wrong kind of stretcher.' You can imagine how we felt."

The fire had started on the second floor of the Museum just before noon. The building was undergoing considerable renovation, including a $630,000 modernization of the air-conditioning system. The work on the second floor was nearly completed. All of the paintings on that floor had been taken down—with the exception of a tremendous Monet *Water Lilies*. It had been left where it had been permanently installed on a hardboard wall partition, and to protect it, an enclosure, also of hardboard, had been built around it.

Was the villain a spark?

The smaller, easily transportable canvases had been moved to temporary storage in the annex next to the main building. There were, however, seven large paintings which because of their size had been stored in slots between hardboard partitions to protect them from flying plaster dust and possible flying paint. The job of painting the walls and ceilings was about half done. Wooden scaffolds were still in place and drop cloths were strewn about. There were also 35 gallons of paint standing in open cans on the floor when the painters went out to lunch.

One theory, which many of the staff seem to remember best, is that the villain was a spark from electrical equipment which was being installed. The other theory seems more likely. The workmen (who smoked on the job) had started cleaning up the mess caused by the renovations, and there was an accumulation of rubbish on the floor. Somebody, so this theory goes, had dropped a lighted cigarette onto one of the painters' drop cloths. In any event, one of the plasterers came back from lunch and found a small fire in a drop cloth near the open paint cans. "He yelled for help," according to a detailed report issued by the National Fire Protection Association, "and a guard responded. They tried to put out the fire with an extinguisher,

This article is adapted from Russell Lynes' book, Good Old Modern, *to be published by Atheneum later this month. A widely known author, he appeared in the first issue of* SMITHSONIAN *(April 1970) with an article on the Metropolitan Museum's centennial.*

but it was advancing rapidly. The paint in the open cans caught quickly and then fire flashed over the newly painted panels. The wooden scaffolding and rubbish collections nearby added fuel to the flames. The paint and paneling gave off thick, black smoke."

Smoke was as wicked as flame—indeed, in the final assessment, a good deal more wicked. It filled the main staircase, poured into the new air-conditioning ducts and the openings that had been made for new pipes and conduits. It filled the fire stairs and the area between the original glass wall of the south facade and the false wall that had soon been built behind it when it was discovered that the glass let in too much light and heat. Smoke, in other words, spread all through the building from the second floor to the members' penthouse on the sixth.

Bernard Karpel, the Museum's librarian, had left his office in the annex and was on his way out to lunch just after 12 o'clock. "The first thing I knew about the fire," he said, "was when I came out of the [street] door and a large piece of plate glass missed taking off my left arm by about 12 inches." On the sixth floor of the annex, one of the curators, Sam Hunter, had found himself enveloped in acrid smoke. He had, according to Karpel, picked up "a rubber plant or something heavy" and smashed the window with it. No general fire alarm had been sounded in the building "for fear of panic," but an alarm had been sounded on the office floors in the main building and in the basement. It had not been sounded in the annex.

However, when Karpel emerged, fortunately in one piece, 53rd Street was filled with firemen, with pumpers and hook-and-ladders, with police prowl cars, ambulances and hundreds of people standing in front of the Donnell Library directly across the street.

Looking down on this scene from the Museum's penthouse terrace were about 200 other people, some of whom had been there when the fire started. The others had climbed there by the fire stairs, as the rising smoke had turned them back from their attempt to head down to the street exit. One woman who had got as far as the fifth floor of the annex rushed into the architecture department and, finding herself enveloped in smoke, smashed the window with a telephone, threw her purse and shoes and straw hat out and screamed for help. The firemen in the street saw her and ran an extension ladder up to the window and helped her out. She made it, although there was a moment when the crowd gasped as she squirmed in the fireman's arms to adjust her dress.

Alfred Barr, the Museum's director of collections, and about 15 of his colleagues were in the executive offices on the fifth floor of the main building when the smoke became dangerously thick as it poured out of the open ducts. At the extreme southeast corner of that floor there was a high window of heavy plate glass that was not intended to open, but by climbing on a desk and using the heavy legs of a swivel chair, Barr and one of the others managed to smash the window and clear the jagged edges at the sill. Then they climbed out onto the roof of the house next door.

It was a house owned by the Rockefellers and lived in by one of them, Mrs. E. Parmalee Prentice, John D. jr.'s sister. A friend, to whom Barr related what had happened, recalls: "In no time at all the butler appeared and said to Alfred, 'You cannot come onto the roof of this house.' Alfred thought quickly and asked himself, 'What do you do with servants? You treat them like servants.' So he said; 'There will be many more coming. Have the stairs clear so that they can get down out of the fire.' And the butler said, 'Yes sir,' and led the way."

Nelson Rockefeller to the scene

At noon, a few minutes before the fire started, Allen Porter, then acting secretary of the Museum, had gone to lunch at a nearby Italian restaurant. When he came sauntering back, he found 54th Street blocked. "I asked a cop what was up, and he said the Museum was on fire." He made his way through the Whitney to 53rd Street just as Nelson Rockefeller came along. He had been walking down Fifth Avenue when he saw the fire equipment and ran down the block. He dove into the building. It was he who kept the firemen from breaking through the false wall on the third floor with their axes. On the other side of that wall was *La Grande Jatte* and the greatest Seurat exhibition that anyone had ever assembled anywhere.

Not a single Seurat suffered any damage except, at the worst, a slight film of smoke which offered the conservation department no real problem. When the Mu-

Firemen have broken through windows of the south facade, revealing false wall which is already aflame.

Alfred H. Barr jr. and Nelson Rockefeller (wearing fireman's coat) hurry through smoke-filled halls.

seum's director, René d'Harnoncourt, who had not been in the building when the fire started, got to the third floor, he found Rockefeller in a helmet and, no doubt, his element. There, with the help of a sort of bucket brigade of 30 of the Museum's staff—guards, secretaries, carpenters, curators, librarians and the maintenance crew—the paintings were carried down the stairs and into the adjacent Whitney Museum. *La Grande Jatte* (p. 63) was a special problem. Because of its size (with its frame it weighed 500 pounds) and its importance, it had been very carefully fixed to the wall, a protective glass had been put in front of it, it rested on a raised platform and, lest anyone get too close to it, there was a barricade. But, as Karpel later said, it was removed "in the face of all the excitement, all the heat, all the smoke with great quiet and precision. That's the time the crew really came through. René was there supervising it. It was remarkable to see how they worked, slowly undoing things in exactly the reverse order in which they'd been done, very carefully, very deliberately. They could have been doing it on a moonlit night in their own backyard."

The exhibition of paintings by Juan Gris offered less of a problem. They were hung on the first floor where the smoke was minimal and they were more easily removed. One of the heart-stopping aspects of these two shows, the Seurat and the Gris, was that both of the artists had died young (Seurat at 32, Gris at 40) and the exhibitions represented a very substantial portion of their entire work.

The fire was officially "under control," which meant that it was almost out, by 1:20 P.M., about one hour after it started. The minute the last of the borrowed paintings was out of the building, d'Harnoncourt's secretary started sending telegrams to everyone who had lent a picture to the exhibitions. "By 3:15," d'Harnoncourt said, "143 telegrams had gone out, in-

Crew covers Chicago's prized Seurat, *La Grande Jatte,* to protect it from smoke. It was not damaged.

forming every lender what had happened." Three weeks later the Museum reopened the two exhibitions, and no one who had lent to the shows refused to let his picture be shown again. One woman, who had lent a painting and was furious when she heard of the fire but had got a wire that afternoon saying her picture was safe, wrote: "Any museum that can have a fire and a wire on the same day must be all right."

Much of the building was a smoke-scarred, waterlogged, glass-strewn shambles. An electrician was dead, face down in six inches of water on the second floor. Thirty firemen were injured, but there were no fatalities. Water dripped from the blistered ceilings and lay in deep puddles on the floor. There had been a misunderstanding. A plumber mistakenly reported to the firemen that a standpipe that was out of commission had been repaired; when they attached their hoses and started their pump, water poured out of an opening on the fifth floor and began cascading down the rear stairwell. One result was that a great deal of correspondence that had been stored in the basement got soaked. "Some people helped themselves to some of it," Allen Porter said, "to get autographs of Picasso and other people."

Barr and d'Harnoncourt had stayed to the bitter end of the day. While the crew had been removing the pictures, Barr had gone around the galleries feeling the walls for heat in order to determine where there was the most danger, and like d'Harnoncourt he had helped to lug pictures as well as direct the others.

According to Elizabeth Shaw, the Museum's director of public information, "By the end of the day René was absolutely exhausted and he seemed terribly upset. The AP reported that the extent of the damage was very small, that the fire was out in 20 minutes; but the afternoon papers had a headline that somebody had died, and that was true. René looked at that and said, 'Why do they have to pick the worst thing?' René was never one to blame anyone for anything. He took the responsibility for all the bad things and not the good ones."

No one at the end of the day knew for certain how bad the bad things were or how many good ones there were to be thankful for. There had been more than 2,000 paintings in the Museum when the fire happened. Of these, some 530 were exposed to smoke; less than a year later, 84 of them had been cleaned and four of these had received "major treatment." (Cé-

After the fire the left side of Umberto Boccioni's *The City Rises* (1910) appeared to be a loss.

The painting was expertly cleaned and restored, however, and today it looks as it does below.

The Museum of Modern Art (Mrs. Simon Guggenheim Fund)

zanne's *Pines and Rocks* and Gris's *Still Life* (1911) had been relined; Kuniyoshi's *Self Portrait* and Orozco's *Zapatistas* had been "infused [from the back with a wax adhesive] and restretched." By comparison, these troubles were minor indeed.

The big Monet *Water Lilies* was burned to a crisp, stretcher and all, a total loss. Nothing was left but "small charred fragments." A large canvas, *Festival, St. John's Eve,* by the Brazilian Cândido Portinari, to whom the Museum had given a one-man show in 1940, "was burned through the upper half and torn beyond repair." Seven other canvases had been severely damaged, and Barr gave a brief report of what had happened to them to the Committee on Museum Collections when it met just a week after the fire.

Like a sheet of boiling tar

The Portinari got thrown out by mistake. The charred frame with remnants of the canvas had been too large to remove during the fire, and the next day a clean-up crew that the Museum had hired to help the regular staff had swept it out with other refuse. *The City Rises,* a large, brilliant oil (opposite page) by the Italian Futurist painter Umberto Boccioni, was badly burned, one-third of it beyond repair, but Barr felt that the rest of it might be salvaged. In his regard it was the most serious loss of all since it was unique, like no other painting by Boccioni, and therefore irreplaceable. (It was, however, very expertly restored and partly repainted, and it hangs today with the Museum's permanent collection.)

A smaller Monet *Water Lilies,* which was hanging in the stair hall, was charred over its entire surface and was considered "probably a total loss." It turned out to be. Its surface was a mass of bubbles, like a sheet of boiling tar. (The Museum gave it to the Conservation Center of the Institute of Fine Arts, New York University, so that students might study it.) *The Jungle,* by the Cuban painter Wilfredo Lam, suffered some fractional discoloration. It was painted in gouache on paper and had been covered with Plexiglas. If it had not been, it would have vanished. Instead, it was cleaned of smoke and soot and it is back in the collection. *Faust I* by Jan Müller was charred along one edge but was otherwise intact.

Larry Rivers' *Washington Crossing the Delaware* fared less well. While only one small area in the lower right was burned, the whole surface had been discolored by heat and smoke. The picture was painted in a mixture of oil, pencil and charcoal, and it was unvarnished, which made it almost impossible to clean.

There were two other casualties, both of which after a period of prolonged and careful recuperation regained their places on the Museum's walls. One was Pavel Tchelitchew's *Hide-and-Seek (Cache-cache),* frequently referred to as "the most popular picture in the Museum." Its entire surface, painted in oil on canvas with intricate and subtle glazes, was dulled by the smoke, and Barr thought it unlikely that it could be brought back to its original state. The oil medium proved tougher than expected, for when the soot was cleaned off, the colors appeared unharmed.

The other casualty was Jackson Pollock's *Number 1, 1948* (pp. 66-67). It had been hanging on the third floor landing during the fire and the surface had been covered with a heavy smoke deposit. It presented a very special problem. Pollock used house paint and radiator paint and almost anything else he could lay his hands on, and he had put them on unprimed cotton canvas, which, it was feared, could not be cleaned without staining. However, the artist's glue sizing in the unprimed canvas permitted successful cleaning.

Back in business, but short on funds

Obviously, the first order of business was to get the Museum back into business. Before the day of the fire was over, crews were already sweeping up; by the next day carpenters were wielding their hammers, and the materials for rebuilding were piling up on the sidewalk of 53rd Street. Where windows had been smashed, there were panels of Masonite. "Hard as it is to believe," *The New Yorker* reported, "the building has already come to life—has even begun to sparkle a little in its old, bold fashion." On April 29 the Museum posted a sign on its front entrance which thanked everyone "for the many kind messages and generous offers of help." They had come from everywhere. "The whole of New York wept for you last night," Rosalind Constable of *Time* wrote to Elizabeth Shaw. "There was in fact an extraordinary atmosphere of grief abroad. The lovers of the Museum gathered at dusk along the street outside, and gazed up in silence."

A number of men and women, some of whom lived at a great distance, had asked if there was any way in which they might get hold of a few square inches of the ruined Monet *Water Lilies.* These requests were, of course, politely declined. One elderly man naively, but kindly, offered to lend the Museum a color reproduction he had of a painting of water lilies that hung in his recreation room, in case it would be any help in restoring the damaged pictures.

When the Museum as a whole reopened to the public on October 8, it did so with a lavish gesture. Let no one think, it seemed to say, that we are not only open for business but we are as safe as a church, as permanent as The Faith and have the unqualified confidence of everyone in the security of our custodianship.

The big splash was on the second and third floors.

Here was an exhibition of "Works of Art: Given or Promised" to the Museum. "Their extraordinary quality is obvious," Barr wrote in a special issue of the Museum *Bulletin*. Here were two new-old Cézannes, a splendid Degas, a Gauguin, two Klees, a Delaunay, two Légers, a Matisse, two Mirós, a Mondrian and so on down the alphabet to Vuillard (three of them) by way of ten Picassos, two Renoirs, two Seurats and two smashing Toulouse-Lautrecs. This was not all, but it gives the flavor of a show which was predominantly European rather than American.

Two nights earlier there was a large dinner in the Penthouse for trustees and committee members, critics and donors and lenders of pictures or sculptures to the exhibition, and several artists. Nelson Rockefeller, as chairman of the Museum's board (and by then a gubernatorial candidate), was host. After thanking those present and "thousands of individuals throughout the country" for contributing to the Emergency Fund, Rockefeller told how the building, which was now about 20 years old, was being rapidly outgrown.

"Our attendance has more than doubled, our mem-

Smoke discoloration affected Jackson Pollock's *Number 1, 1948* (above). Light-colored areas have already been cleaned with a combination of bleach and detergent. It is now back on view (right).

bership has grown sevenfold," he said, and though a lot had been accomplished in the last few months to improve the Museum's facilities, "we still lack a great deal of space to show the Museum's collection in all its diversity . . . and we lack the resources to execute fully the program for which we are qualified by our knowledge and experience." He also said that his dinner guests would be "glad to know" that René d'Harnoncourt and other insiders were "studying plans for additional building and exploring ways and means to raise the necessary funds."

Glad to know? It was going to cost them $25 million and a stupendous amount of arm-twisting. But the phoenix was on the wing.

The Museum of Modern Art

By Hugh Moffett

Troubles brew below a lake's shining surface

Can villagers and visitors in a small town take unsought academic advice and do their part for our aging waters? Perhaps

One wishing to recapture a set of emotions that must have thrilled the American Indians might contemplate one of our northern clear-water lakes. Sometimes a pale mirror at dawn, it shimmers later as the sun and breezes dance from shore to shore. With brilliant fidelity it reflects the blue of sky and endless shape of cloud. By evening the reddening light showers the eastern shore and creatures of the timber come down to bathe and drink.

Lake Mascoma, lying in a lovely valley six miles east of Lebanon, New Hampshire, is just such a lake. Well, at any rate, Mascoma *used* to be such a lake. Now as the motorist approaches the lake he encounters diamond-shaped highway signs saying "THICKLY SETTLED." The words eloquently explain why now you can ski on the water but you wouldn't want to drink it. It's OK to swim there, but who would want to when the algal bloom turns the surface kelly green as it has several times in recent years? The lake surface still shimmers in the sun but underneath there is a worrisome content of raw sewage.

Scientists have a word for what has been happening

Detergent foam is added to classic combination of children and water in a Lake Mascoma tributary.

Neat New England homes surround the blue lake, but below its shimmering surface is too much sewage.

to Lake Mascoma: "eutrophication." Eutrophication is sometimes called "maturing," a perfectly natural process that occurs even in remote Arctic lakes where there are no people. If a lake matures enough, with increased algae and other plant life, it matures right into a swamp. But eutrophication can be speeded up by the oversupply of nutrients that are derived from "thickly settled" people. The Mascoma people have contributed generously of nutrients, sewage, detergents and other wastes. The process apparently has been building up for years at Lake Mascoma, but it took the first big algal bloom in 1969 to arouse people to action. It is little comfort to Mascoma folk, meanwhile, to know that this threatening condition hangs over many another North American lake.

Almost all the 3,000 souls who live all or part-time on Mascoma or in the town of Enfield on the eastern shore will be, to a greater or lesser degree, better off if the lake doesn't die. For example, John Essenberg, a sales executive now situated in London, England, loves the lake so much that he and his family journey there to pass each vacation in the cottage they own on the eastern shore. Mrs. Robert G. Smith, a registered nurse in Keene, New Hampshire, has been taking small mouth bass from Mascoma for years. She wets her line at 4 A.M. and wants the lake to live. A Dartmouth graduate presently employed as a blacksmith whacks an anvil in a square hut near the Lakeside Motel (see cover). A psychology major named Dimitri Gerakaris, he now finds reward in working with his hands, making things of iron. Although only ten percent of his business arises because of his proximity to the lake, he says: "If the lake wasn't here, you wouldn't find *me* here."

The property owners, storekeepers and the children who love water and ice all have a stake in holding back eutrophication. All think something should be done. A massive effort to help came gratis from a surprise source, Dartmouth College. The investigators—students with biological, economic, political and sociological interests and with faculty advice—carried out an exhaustive study of the causes of Lake Mascoma's malady and remedies for it. A dozen investigators commuted to Mascoma in the summer of 1971, nosing into

Photographs by Carl Mydans

every phase of life, and left no feelings harder than those of an Enfield selectman who observed that "Dartmouth needed something to study and Mascoma happened to be nearby." In 1972 the Dartmouth group published their two-pound, 334-page study. The $18,000 "Mascoma Lake Project" reported conditions and made hard recommendations for saving the day.

To begin with, there are two distinct population elements at Mascoma. Most of the 250-odd houses on the lakeshore are owned by nonresidents. The town of Enfield, which brushes the lake, has mostly permanent residents. The lake people (who are mostly seasonal residents) pay 30 percent of the half-million dollars collected in property taxes by the town but they cannot vote in the town. The year-round residents worry not about the lake alone but also about such things as education and roads. The setup is perfect in a way: Each element can blame the other for 90 percent of all ills.

The sources of pollution are no mystery. Some town and some lake residents dump sewage and other wastes directly into the lake or into the Mascoma River, which splits the town just before emptying its gamy cargo into the lake. The Enfield Elementary School pipe goes directly into the river with no treatment. A half-dozen streams drain a vast basin as big as a county, converging in the lake with sewage and detergents from as many smaller communities. Some of the collection passes on through, going out by the northeast corner where the Mascoma River proceeds to the city of Lebanon. The lake is the water source for Lebanon.

The Dartmouth team found good news, too, in one sense. The A. G. Dewey Textile Mill two miles up the Mascoma River was generally believed to be a major polluter. Faced with the expense of reducing pollution along with perhaps greater problems, the mill closed permanently in February 1971. Some had estimated that a third of the lake's pollution had come from the mill. By the time the Dartmouth investigators got there with their gauges, that source was gone—but they found that the Mascoma River was nevertheless the major contributor of nutrients to the lake, supplying 85.6 percent of the nitrates and 88.2 percent of the phosphates. Still contributing briskly was the upstream town of Canaan.

The students noted that many homes and businesses have sewage treatment facilities, septic tanks and leaching fields. The adequacy of some is in doubt due to casual inspection. Some of the cottages are on lots so cramped or close to the lake that there is no room for such facilities.

Naturally, the study found a paucity of public money to build a sewage system. Several years earlier Enfield had hoped to get federal and state funds to install a system which would tie into a planned Lebanon system. This fell through and, with a total annual budget of around $700,000, Enfield officials were appalled at the price of building their own, which could easily run to a million or two. They long for state and federal aid which would leave them only five percent to pay, still an economic luxury.

A questionnaire given residents revealed that 78 percent considered pollution to be a problem. To the question "would you be willing to pay $1.60 per $100 assessed valuation to build a treatment facility?" 47 percent answered "yes" while only 40 percent didn't care for that idea.

When the moment of truth came and the team had to make its $18,000 worth of recommendations, it was fearless. It decided, everything considered, that a conventional sewage treatment plant would not be the best solution for the area. It recommended a package of smaller efforts.

One suggestion would cost very little—a public campaign to reduce use of high-phosphate detergents. If successful, they promised, that alone could cut phosphates entering the lake by 40 percent. For instance, why not use some good old-fashioned laundry soap?

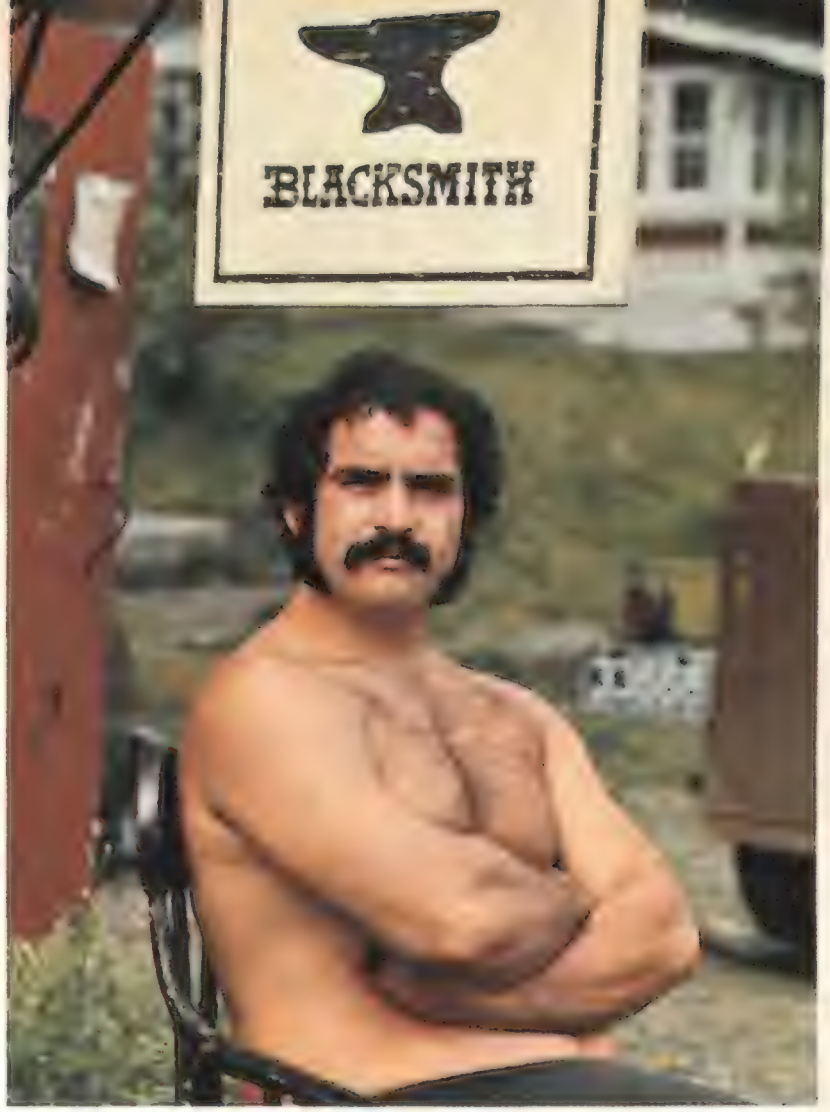
The second recommendation urged individuals to go as far as possible with septic tanks and leaching systems. It urged the local government to get tough with inspection and the ordering of new installations, all systems to be up to the standards of New Hampshire's Water Supply and Pollution Control Commission, the state body in charge of such things, known as the WSPCC. Where septic tanks could not be built the study urged holding tanks which can be periodically

Mr. Moffett chronicled the status of the black walnut in the March issue of SMITHSONIAN. *Not long after photographing Lake Mascoma, Mr. Mydans began working out of Singapore.*

emptied. And here the team got helpful on toilet flow, suggesting that bricks put in the tank would reduce the volume of water for each flushing, and also that non-toilet waste simply be filtered through sand and returned to the lake.

An innovative recommendation for cramped houses proposed a multidwelling system where each house would have its own septic tank, but these tanks would drain off to a common leaching field for up to half a dozen homes. It urged the government to help such cooperation along by writing a model legal contract and helping the residents to acquire necessary land by official influence, sewer easements, tax abatements or even direct purchase.

Admitting that the foregoing was only part of the answer, the study suggested that Enfield construct a modest central system. The team found that compliance with state and federal requirements could make enough aid available to render the local cost bearable. The team thought it would be nice to set up a somewhat newfangled, spray-irrigation system that turns sewage into a fertile prairie. "Perhaps the fertilized land could yield a return by producing Christmas trees, hay, etc.," they hoped.



The Enfield blacksmith, Dimitri Gerakaris, graduated from Dartmouth in 1971. Like many young college graduates these days, he enjoys working with his hands and is a supporter of the Mascoma clean-up campaign.

Storekeeper Warren Proctor tried to keep wastes from his laundry from entering the lake and tried pushing low-phosphate detergents in his store. "Some heeded, some didn't. It did some good."

Selectman Arthur Blain warned against stricter inspections. "You don't want to cause trouble."

So attractive is Mascoma to the Essenbergs that they come annually from London, England.

With the community thus instructed, the Dartmouth probers looked beyond and found that state and federal officials are hidebound, biased in favor of conventional plant construction and of "regionalization," which means long, expensive piping to link more than one community. They pleaded with higher governments to make support money available for innovative alternatives, such as those suggested for Lake Mascoma. Recognizing the complexity of the clean-up task, the study has this plaintive sentence: "The WSPCC should insist that engineering reports be comprehensible to local officials."

Finally, the report found that copper sulfate, which had been used in the lake to treat two Mascoma algal blooms, should not be relied upon again. It may open the way for toxic strains of algae and, furthermore, it may harm fish.

So now it is almost two years since the Dartmouth crew combed the lake and what has been done? It is tempting to answer with one melancholy word: nothing. That would be unfair (if only slightly). Indeed, the community stirrings are enough to sustain a small hope that Mascoma will once again be crystal clear and potable, if not in this decade perhaps some time in the next.

In 1972, when a Lebanon realtor and antiques auctioneer, Roger J. Roberts, became president of the Lake Mascoma Association, composed mostly of nonresidents, he talked of bridging the social gap between its members and the permanent residents. He urged get-acquainted events, sports contests and exhibitions, instruction in swimming, fishing, lifesaving, waterskiing. He thought this would counteract the reputation of members as outsiders screaming at the locals to clean up. The social program didn't get far in 1972, but Roberts did get the membership together for two meetings rather than one. Furthermore, the association gets credit for a somewhat effective campaign against high-phosphate detergents.

A phosphate proclamation

At the first meeting, Warren Proctor stood up to say his store would stock the preferred detergents and put up a sign pushing them. For 22 years Proctor has run a general store in Enfield Center, a "wide place in the road" a mile south of Lake Mascoma, smack on the shore of the Knox River. He operates a public laundry next door. There were those who said, "Yes, he talks about detergents while all his laundry waste is going into the river and lake."

Proctor, however, will show anyone interested his septic tank, leaching field and a shack where a pump kicks in when necessary to lift surplus to a pond. "Of course," he says, "I would be kidding myself if I didn't

admit some of the water finds its way back into the river." And as for his detergent customers, he says, "Some heeded, some didn't. It did some good."

The Enfield selectmen added to the pressure in August with a proclamation which, after all of the "whereases," said:

"WE THEREFORE call upon all residents of Enfield to make a serious effort to aid in reducing the phosphate content of Enfield's surface waters by using only soaps or those brands of detergents with no phosphate content or of low phosphate content for all cleaning, dishwashing and laundry purposes."

Conditions acceptable—and precarious

There was no algal bloom in the summer of 1972 and only a mild show in the fall, and the lake remained clearer and cleaner than in previous years. The bacterial content was at "acceptable levels." By 1973, however, an argument persisted as to whether improved conditions resulted from the mill's closing or from excessive rainfall which flushed the lake. Professor Harold Allen of the Dartmouth study thinks it would not be the rain, which also would wash in extra fertilizer from the fields along with other nutrients. Nevertheless the team found the condition precarious, though improved. Perhaps the detergent campaign helped. At least it demonstrated beyond a doubt that the community is concerned and can cooperate in response to leadership.

Not all New Englanders, however, are given to newfangled ideas or to certain kinds of cooperation. New Hampshire's motto is "Live Free Or Die" and for some, to "live free" is to dump raw sewage into the nearest water. When asked whether the town couldn't order its health officer to police the raw-sewage dispersal, Selectman Arthur W. Blain smiled: "Well, you wouldn't want to cause trouble."

Enfield selectman William A. Maloy is not one of those, but he does share in a problem. He lives in the village on the bank of the Mascoma River. "My home is on a pipe which collects waste from seven or eight homes and pours it directly into the river. What should I do? It will cost $1,500 to install a septic tank, after which the pipe will still be going by me and into the river. And presumably we will have a general system for everybody in a few years."

There was rejoicing in sewer circles when Congress passed the clean water act over President Nixon's veto. An official of the WSPCC explained in the fall of 1972 that the federal government would now pay 70 percent of all costs of plants and collection systems. He was certain that the President would not tamper with the amount, but a few days later President Nixon ordered the two-year amount cut by $6 billion.

The Montgomerys run a lakeside motel and had a good year but "last year the lake was kelly green."

Roger Roberts, realtor and auctioneer, tried to pull the summer people and villagers together.

Troubles at Lake Mascoma

Whether or not any golden effluent from Washington finds its way to Lake Mascoma, cleaning up the lake will also take time, as evidenced at the second 1972 meeting of the Lake Mascoma Association. The meeting was held in the bingo hall of a boys' seminary and shrine operated by the order of Our Lady of La Salette on the site of a former Shaker village. President Roberts that day had spent seven hours crying an auction of antiques and did not run a terribly tight meeting. One lady took up some time trying to ascertain when the annual dues had been raised from $2 to $3. A nonmember showed up to speak on the subject of a cottage she had rented for herself and 11 children which proved also to house rats. After about half an hour a member arose to inquire, "Why have you called us here?"

Nevertheless, business was eventually done. It was decided not to employ the "pill test." This proposal involved talking all the people into tossing a dye pill into their toilets. If the nearby lake or river water turns red in such and such a time, like a jiffy, something needs to be done. The feeling seemed to be that some people approached with the pill might invoke the state motto.

It was proposed that a bubbler system to air out the lake and induce oxygen be installed at a cost put at $22,000. One member urged this so strongly that another muttered, "He must own a piece of the bubbler." The association voted to await more wisdom and guidance on bubblers.

There was one positive action. The meeting voted to donate the sum of $500 from association funds as a token gift to the town of Enfield to get a system started for the elementary school.

And so now, as the lake comes to life in 1973, so will controversy—and maybe progress, though the lake's problems were not on the agenda for a spring town meeting. Nonetheless, perhaps we have just chronicled Mascoma's blackest hour. We can be fairly certain the lake will eventually be saved because it is worth saving. The Dartmouth team took hope from their finding that younger folks in general were most concerned about the lake.

Perhaps they didn't give enough weight to Bertha Saunders, 86, who tends her garden with the use of crutches. A brief visit with Miss Saunders revealed that the lake has been the love of her life. She lives alone in a big house of erstwhile glory on a slope high above the west shore.

"If it's about the lake, come in," she said. "My father all his life wanted a house here on this point, but he was 54 years old before he could afford it. I'm not much for pictures, but if it will help to save the lake, all right."

Miss Saunders went outside and drank in again the long view of the lake, which she has watched for 70 of her 86 years.

"We used to catch all kinds of fish. Bass, up to two or three pounds. There were pickerel and other kinds, too. Fishing was very good then. Something ought to be done about the lake."

Bertha Saunders, 86, has lived 70 years in a big house overlooking the lake and she remembers earlier times when the fishing was still good.

A member of the Lake Mascoma Association asked "Why have you called us here?" The association then voted to give $500 to help build a sewage system.

By Kenneth Koyen

French Canada's colonial fort is being built anew

At Louisbourg, dreams of a New France rose with every stone, then fell. Now it is being rebuilt as the Dominion's Williamsburg

All New England was astir. Drums were beating to assemble militiamen. Recruiting officers were exhorting the citizen soldiers to volunteer for a campaign that would take them hundreds of miles out to sea.

The year was 1745 and the first American Expeditionary Force was in the making. At the urging of William Shirley, the Colonial governor of the Province of Massachusetts Bay, the House of Representatives agreed that "application be forthwith made to the Governments of New York, the Jerseys, Pensylvania [sic], New Hampshire, Connecticut & Rhode Island to furnish their respective Quotas of Men & Vessels to Accompany, or follow the Force of this Province." The target was Louisbourg.

The name has lost its clangor over the centuries, and today rings faintly, if at all, for Americans. But 200 years ago Louisbourg was a word that sounded an alarm for all American Colonists, especially New Englanders. Louisbourg was an immense fortress which the French had erected on the remote island of Cape Breton, Nova Scotia. It was important because France and Great Britain had been in open combat for a year,

because much of New England was menaced by French and Indian raiding parties, because travel was mainly by boat, and because Shirley saw the disputed area of Nova Scotia as the extended flank of both the British and French positions in North America. He understood that whoever controlled Louisbourg Fortress and its base of sea power at Louisbourg Harbor also held within his fist the ocean gateway to the St. Lawrence River, the Citadel of Quebec, all of Canada and France's hopes for a place in the New World. The fact that English, rather than French, is the spoken language of the United States was determined more at Louisbourg than at any other single place.

The mainland of Nova Scotia, connected to the rest of Canada by a slender neck of land, was ground hotly contested by the French and New Englanders for a century before Shirley launched his military adventure. Yankees first captured the town of Port Royal in Acadia, as the French then called Nova Scotia, in 1654. By 1713, the aggressive New Englanders had wrested all of Acadia, except for Cape Breton, from the French. Their backs pushed against the North Atlantic, the French, decided to make a stand on Cape Breton by building a mighty fortress on the island—the most extensive in all of Colonial North America.

It took 25 years to build and drained the equivalent of some $10 million from Louis XV's coffers. When it was finished, the proud fortress had a fatal flaw. The defenses concentrated almost entirely on the possibility of attack from the sea and neglected the landward side. The British fortress of Singapore was to demonstrate the same weakness two centuries later.

Two of France's ablest military engineers, Verville and Verrier, laid out the plan, with walls, bastions, moats and firing positions providing supporting defenses. French troops were set to work on the site, an isolated shore surrounded by bogs, rocks and spruce thickets. Ship after ship brought stones from Caen, in Normandy, for the foundations and walls. Bricks, too, were imported until suitable clay was found.

Nearly two miles of massive walls enclosed an area

Koyen, once of the old New York Herald Tribune's *Paris edition, has written a World War II history.*

Gilded by sunset, Louisbourg's walls at Cape Breton Island shield rebuilt houses and cupola of the Citadel.

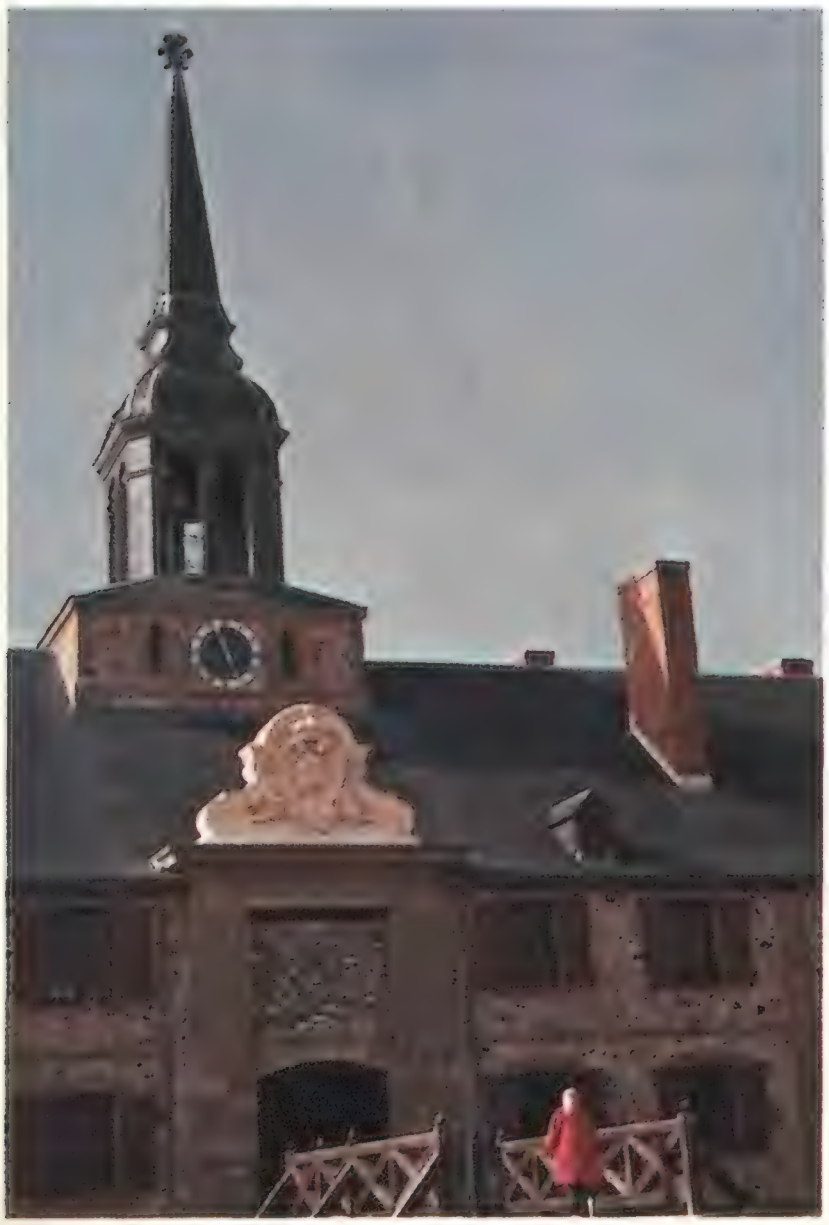
Photographs by Ivan Massar

of about 70 acres. Within the walls there were gun embrasures, casemates and a town of 1,463 inhabitants. As many as 3,000 troops could be garrisoned there, at a time when the British capital of Colonial Virginia at Williamsburg, far to the south, had a total population of about 1,000. The main defensive position within the fortress was the Citadel. The barracks building in this area was one of the largest structures in North America—363 feet long, three stories high, with 100 rooms. A dry moat, a drawbridge, a palisade and earthworks protected its inner entrance. Its seaward side faced the King's Bastion, one of the stoutest features of the fortress. Beyond was the 30-foot-high wall, bristling with cannon.

Outside its walls, the fortress was supported by a system of strongpoints covering Louisbourg Harbor and its narrow entrance. The Island Battery of guns was located on a small island northeast of the fortress. The Royal or Grand Battery was placed on the northeast shore of the inner harbor about one mile from both the Island Battery and Louisbourg.

Having invested such enormous effort and a vast sum of money in Louisbourg, the French government sat back and relaxed with a false sense of security. Stones had been badly dressed and laid, mortar improperly mixed with sea sand. As a result, the landward walls and the Royal Battery were in bad repair. Only some 600 soldiers were stationed in the fortress, mostly men who had labored on the construction. Few had seen combat. Led by Swiss mercenaries, some troops had mutinied during the winter of 1744-45. The situation remained uneasy that spring.

Governor Shirley and his New Englanders were well posted on conditions at Louisbourg. To encourage enlistment of some 3,000 volunteers, it was decided that "there be delivered to each man a blanket, that one month's pay (25 shillings) be Advanc'd & that they be entitul'd to all the Plunder. . . ." Later, the inducement was sweetened to include "half a Pound of Ginger, and one Pound and a Half of Sugar." Equally important was the selection of a popular commander-in-chief around whom the militiamen would rally.



Blue enamel clock face atop the barracks building has been restored, authentically, with only one hand.

Dining table in the governor's house is set as if to welcome dignitaries of old French Canada.

Shirley found such a man in William Pepperrell of Kittery, Maine, then a region of Massachusetts. A lumber and fish merchant, he was also a colonel in the local militia and president of the Massachusetts governor's council. He was reluctant to accept the commission, but the governor pointed out that unless the French were frustrated by an expedition, they would invade "ye eastern part of New England, & Newfoundland would have stood but a poor chance, so that ye greatest part of y^{e} codd fishery in a short time would have been in y^{e} French hands, and great part of our trade to New England, Verginia, etc., intercept^{d} by y^{m}." This proved a telling argument to a fish merchant.

Recruiters went to work, declaring that Louisbourg would fall at the mere appearance of the expedition, that the fortress was so crammed with wealth that every man could become rich from plunder. Some ministers foresaw a religious crusade: ". . . and how sweet and pleasant will it be . . . to be the person under God that shall reduce and pull down that stronghold of Satan and sett up the kingdome of our exalded Savviour. . . ." However, some parsons in the minority warned that those volunteering "would dye there [at Louisbourg] and be dammn'd to [o]."

More than 3,000 Massachusetts men volunteered for the land force; some 1,000 more agreed to sail the expedition's ships. Connecticut raised 516 volunteers to sail from New London in a fleet of seven transports guarded by the colony's sloop *Defence*. New Hampshire turned out 304 volunteers to sail on that colony's guard vessel, with a crew of about 30. Although the contingent was short of Shirley's expectations, the expedition took most of the able-bodied men from that region. Mrs. James Johnson, an early settler on the Connecticut River frontier, complained in her diary that Shirley's wild scheme had drained the "thinly inhabited state of New Hampshire of most of its effective men" and left it open to Indian attacks. Rhode Island finally decided to lend its warship, the sloop *Tartar,* with a crew and several militia companies.

The New York Assembly settled by lending ten 18-pound cannons with gun carriages. New Jersey turned

Governor's bedroom is within the Citadel, a major unit, now fully restored, in the old fortress.

the appeal down flatly. In Pennsylvania the Quakers in the assembly led in rejecting the petition. From Philadelphia Benjamin Franklin wrote to a brother in Massachusetts: "Fortified towns are hard nuts to crack; and your teeth have not been accustomed to it."

Shirley wrote to Commodore Peter Warren, commander of the British Navy's Leeward Islands Squadron in the Caribbean. A month later, Warren received the letter at his base in Antigua. He was eager to join in the battle and, with the Admiralty's approval, sailed with his warships for Cape Breton. Unaware that the Royal Navy was coming to his aid, Shirley ordered the first Massachusetts contingent to set sail, and 51 fishing vessels converted into transports and carrying some 2,800 men set out from Boston at 4 o'clock Sunday, April 4. A smaller contingent of 200 men sailed the following Tuesday.

The rendezvous point for Pepperrell's force was the small rocky island of Canso, a short sail from Louisbourg. En route, violent storms alarmed the volunteers, especially the landlubbers from inland Massachusetts, who were no more accustomed to the roll of a fishing vessel than they were to its smell. One militiaman wrote: ". . . We Lay Rowling in ye Seas with our Sails Furl'd with Prodigious wave[s] . . . all yt I Took to Eat or Drink vomit up again Sick Day & night/So bad yt I have not words To Set it Forth, nor Can I give any Body an Idea of it yet hath not Felt ye Same or Some thinge like it."

By April 22 most of the fleet and the New Hampshire contingent had arrived at Canso. On a hillside, Pepperrell drew up his troops and reviewed them for the first time. He was dismayed to find that many of them lacked proper arms and equipment. He drilled them and had their arms replaced or repaired until Warren's four British warships appeared.

At daybreak on May 10, Pepperrell's fleet finally sailed for Louisbourg. The following day the New Englanders made a landing in whaleboats on a sandy shore. The French governor, Du Chambon, who had prepared for a sea attack, was caught by surprise.

The Yankees poured ashore, brushing aside a small French force that had been sent out from the fortress. Shots were exchanged; six or seven of the French fell. The shock of battle struck the soldiers as it always does. Theophilus Woodbridge of Connecticut, recorded that ". . . You would Think [it] is an awfull thing to See men wounded and wollowing in their own blud and breething oute their Last breths which I was present my Self in the Action I thought att first that it was Very Awfull."

A group of New Englanders pushed east during the afternoon to about a mile from the fortress, where they came under cannon fire from the guns on the western ramparts. By nightfall of May 11 some 2,000 New Englanders were safely ashore. Not a man had been killed or seriously wounded.

In panic, the French force of 200 men in the Grand Battery spiked their guns and fled into the fortress. The deserted battery contained far heavier guns and

Old print depicts William Pepperrell, colonial commander, in heroic setting outside the fortress.

mortars than the Yankees had been able to bring, and Shirley had had the foresight to equip his expedition with shot large enough for these French guns. In any case, the French left a generous supply of cannon balls and powder. Walking into the battery without firing a musket, the invaders promptly unspiked the cannon, and the French became targets of their own guns.

Within the next few days the New Englanders built 16-foot wooden sledges on which to drag their cannon through bogs and rocks to the area of the fortress. Hundreds of men hauled on ropes to move the guns at night. More troops carried balls, shells and powder on their backs. The guns were set up in batteries and began a systematic bombardment of the fortress.

Impatient to capture Louisbourg quickly, Warren urged Pepperrell to seize the Island Battery, which prevented the British fleet from entering the harbor. The militiamen resented orders from a British naval officer and the assault was put off from day to day. Warren was told, in effect, to stick to his ships. In turn, Warren became contemptuous of the Colonists.

The siege settled down to an exchange of cannon fire broken only by occasional clashes between French troops and Indian raiders on one side and the New Englanders on the other. Then, on May 30, Warren's blockading fleet and the New England warships trapped and captured the large French man-of-war *Vigilant,* with supplies for the fortress. The fight at sea was a decisive point in the struggle for Louisbourg. On June 28 the French decided to give up. Only one house in the fortress stood intact.

Pepperrell and Warren vied, of course, as to which one should take the surrender. Pepperrell marched his men at 4 P.M. through the open south gate before Warren had time to land his Marines. The New Englanders received the keys to the fortress.

The cost of victory was remarkably light. Only 101 New Englanders were killed and 30 died of sickness. About 300 people were killed within the fortress, and some 50 French troops died either inside or outside of the walls. New England exploded in wild excitement. Fireworks and liquor were both consumed in great quantities, rustic poets produced epic verses and cocky Yankees bragged that their citizen soldiers were more than the equal of any European regulars. This attitude had a bearing on later events at Lexington, Concord and Bunker Hill.

At Cape Breton the victorious militiamen, feeling that they had been kept from their promised plunder by the British, wanted to go home at once.

"Faire Well Cape: Britton [they sang]
faire well all you fases
that Bread such Dis:greases
against Soldiers that are True to their King
for I Boldely Do Say
If they once git a way
You will be hard Poot to it to Catch them again.

The bitterest period followed the surrender. An expected relief garrison did not arrive. Shirley, who came to Louisbourg on August 27 to survey the triumph that he had engineered, sent home nearly half of the original force. Reinforcements from New England brought the total to 2,623 in December. But the winter was disastrous for the Americans. Disease was aggravated by drunkenness and inadequate shelter. By the time British Regulars arrived in May 1746 to take over, about 1,200 New Englanders had died.

Two years later the British handed the fortress back to the French under the treaty of Aix-la-Chapelle. The French completed their reoccupation in 1749 and made the fortress stronger than before. But in less than ten years France and England were again at war, and Louisbourg again fell.

This time the British demolished the fortress in a series of explosions and shipped away the stones to build up Halifax, 200 miles to the southwest. That fort city became Nova Scotia's stronghold, and the remains

of Louisbourg were permitted to crumble. A small fishing village clung to the side of the harbor; a few huts were built and sheep grazed in the rubble. The turf-covered stones were the only reminders of the stakes that France had wagered for empire in America.

Not until 1928 did attention once more turn to Louisbourg. Then the fortress was declared a national historic site. In 1940 the place was made a National Historic Park, and visitors began coming in the summers. By 1960—almost 200 years after the destruction—a Royal Commission recommended that the government reconstruct the fortress to stimulate travel and aid employment on Cape Breton. A year later the government decided to rebuild part of the fortress and develop it and 20 square miles of surrounding area as Canada's foremost National Historic Park.

The rebuilding is going on to this day and will continue for several more years. Each season something new is added to the Louisbourg scene, which is already an engrossing panorama of the past. The scope of the project is indicated by the sum—$20 million—that Canada is spending on it.

A major part of the fortress has already risen on the green and rugged island. From the western, or land side of the fortress, the work extends eastward from finished to unfinished projects. Towering walls and completely restored buildings give way to houses which workmen are rebuilding. Beyond lies the freshly turned earth of excavations where crumbled brick walls and stone floors are being uncovered, while archaeologists carefully sift the soil with trowels and whisks. As the land beyond tapers into the sea, only grass-covered mounds indicate the rest of the ruins.

The Citadel is restored. The area comprises the King's Bastion and the imposing barracks building with its governor's wing. With its blue slate roof and high brick chimneys, the rubblestone and masonry structures seem to have been transported from an old French city. In the tower is a clock, in itself an example of the painstaking research that goes into all the reconstruction at the fortress.

John Lunn, superintendent of the Fortress of Louisbourg National Historic Park, tells of the work involved. "In the archives of the French Colonial Ministry in Paris we found plans of the fortress and detailed drawings of its buildings. Among them was the architect's view of the tower, showing the face of the clock

Behind sharp uprights of a rebuilt palisade stand restored stone houses. Few were left after the siege.

with two hands of *fleur-de-lis* design, one drawn boldly, the other in shadow. I studied the drawing for quite a while with a magnifying glass before I decided that the clock had only a single hand and that the minute hand had been sketched in error."

His theory, based on knowledge of clock construction of the day, was confirmed when Jean Palardy, a Montreal historian charged with buying antique furnishings and equipment for the fortress, found a similar clock mechanism in the Alsatian city of Barr. The clock of hand-wrought iron had been built for a church in the 1730s. As it was of the same period as the original barracks clock, which was designed in 1733, the mechanism was purchased and installed in 1969. The face of the clock, in royal blue enamel with a single copper hand to tell the hours, is an exact reproduction of the original.

Mr. Lunn was also gratified when workers dug up, as he had anticipated, a sundial near the tower. The dial, marked for the Louisbourg latitude, would have been used to check and reset the timepiece by the watchman who daily climbed a ladder to wind it.

Mr. Palardy, who shares Mr. Lunn's zeal for searching out authentic articles for the fortress, has one regret about the clock. The bell, which chimes the hours and half-hours, is only a replica of the original bell, which was carried off by New Hampshire troops and installed in St. John's Episcopal Church in Portsmouth, New Hampshire. It was cracked during a fire—and was repaired by Paul Revere.

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Book reviews

The Dragon Empress
Marina Warner
(Macmillan, $12.95)

China was dying in the 19th century; the physician in attendance, bleeding the invalid, was the Empress Tz'u-hsi (1835-1908). This woman was as much a genius at palace intrigue as she was a failure at politics. Originally nothing more than a minor concubine of the sickly Hsien-feng Emperor, she became important when she managed to bear him his only son before his death in 1861. She then succeeded in overthrowing the regents whom the emperor had appointed to rule in his infant son's behalf, and at the age of 26 began her half-century of domination.

At first she had to share the regency with Niuhuru, Hsien-feng's official Empress, but Niuhuru was in any event a compliant, bovine creature. Both women temporarily retired when Tz'u-hsi's son came of age, but two years later, in 1875, the young Emperor died of smallpox. Wasting no time or tears, Tz'u-hsi instantly convened a council and chose the next emperor—another child and her own nephew, who was crowned Kuang-hsu.

Tz'u-hsi and the placid Niuhuru were back in business as regents. But one day the guileless Niuhuru teasingly revealed that she had in her possession a document, written years ago by their mutual husband, which gave Niuhuru the right to decapitate Tz'u-hsi, should she prove to be a nuisance. As Marina Warner recounts: "Niuhuru fetched the decree to show Tz'u-hsi, and laughing at the changed times, tore it up before her. That very afternoon, a eunuch presented Niuhuru, as she gazed into a goldfish pool in the gardens of the Forbidden City, with some milk cakes as a gift from Tz'u-hsi. Niuhuru took a mouthful. By the evening she was dead."

Tz'u-hsi is at once a resplendent and grotesque character. She ruled millions of people but seldom ventured out of the palace. She was a gifted painter, an ardent student of the Confucian classics and a devout Buddhist. She was profoundly self-satisfied; she once remarked: "I have often thought that I am the cleverest woman who ever lived and that others cannot compare with me."

Although China was repeatedly invaded by Europeans and Japanese, she took the money that had been set aside for a modern navy and spent it on a marble boat for her Summer Palace. She refused to permit government reform. In fact, when the Kuang-hsu Emperor initiated radical reforms in 1898, Tz'u-hsi rushed in, reversed his orders, and confined the young ruler to an island palace.

Her biggest blunder was her support of the Boxers. Tz'u-hsi was delighted that these men of the people were loyal to her throne, and in 1900 she sanctioned their siege of the foreign legations in Peking. When the Boxer Rebellion was suppressed, she was forced to flee the capital. For the first time she saw the misery in which her subjects lived—and was appalled. She instituted enough reforms to dampen revolutionary fires and buy off her conscience. In 1908 she died serenely.

Tz'u-hsi was a Manchu, a descendant of the hated warriors who had conquered China in 1644. Unlike the Japanese, who could look to their ruler as a sacred embodiment of the people, most Chinese were unable to muster much enthusiasm for a foreign empress. Moreover, her contempt for Western science and civilization slowed China's entry into the modern world.

Marina Warner has brought together a great deal of information about Tz'u-hsi that was scattered about in scholarly studies and amateurish memoirs, many long out of print. Unfortunately, her style is quite often awkward, and the English text has not been edited for American readers (sums of money, for instance, are left in pounds, and bits of English slang are incomprehensible). But the illustrations are dazzling and well worth the price of admission.

—Edmund White
A specialist in Oriental literature and author of the novel, *Forgetting Elena*

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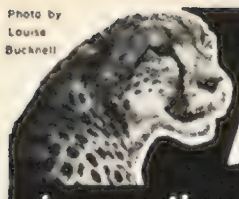

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The Russian Space Bluff
Leonid Vladimirov
(Dial, $5.95)

The thesis of *The Russian Space Bluff* is that the entire Soviet space program, from the first Sputnik to date, was derived from the U.S. programs. All Soviet space shots were scheduled to undercut the subsequent American launchings, the intentions of which were always announced well in advance. These assertions (and there are more!) may well shake the opinions and convictions of those in the West who have followed the "space race."

The author is a Soviet defector, born in 1924. Trained as a mechanical engineer, he spent four years at the Moscow Aviation Institute. He was editor of *Znanie-Sila,* specializing in scientific subjects including space exploration. In 1966 Vladimirov visited London with a group of Russian writers—and decided to stay. Since the book made its appearance in England, where it was first published, the British Interplanetary Society's *Spaceflight* has printed several letters from authorities attacking or supporting the author's views.

Vladimirov identifies the leaders of the Soviet space program: Sergei P. Korolyov (1907-1966), the chief designer; L. A. Voskresensky, his deputy (1913-1965); M. K. Yangel (1911-1971); and others. He states that Korolyov and his engineering team accomplished near-miracles under the most difficult conditions. He describes how the decision to launch Sputnik 1 was given by the Central Committee of the Party only a few months before its launch on October 4, 1957. The Soviet launch vehicle, an ICBM, had made its first flight in August. He describes the close race to put Yuri Gagarin into orbit ahead of the first Mercury flight by Alan B. Shepard, and the search among the backgrounds of the cosmonauts for one with completely "Russian" and "proletarian" origins.

Vladimirov states that Khrushchev ordered Korolyov to advance drastically the date of launch of Vostok 2, in 1961, so that the 17-orbit flight would result in world acclaim—lessening the international reaction to the creation of the Berlin Wall a week later. He reports how the Vostok spacecraft became Voskhod; how it was stripped down to accommodate three cosmonauts for the prestige of such a flight; that they flew without protective spacesuits not because of space-

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Recycling paper is important in the effort to reduce the nation's solid waste problems. A great deal is being done now. But the paper industry recognizes that there must be further efforts to improve waste paper collection and utilization.

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We can begin to appreciate the staggering amount of energy put forth by our sun when we realize that every second the sun converts 5 million tons of mass into energy and radiates it out into space. Light, heat, X-rays—in fact, the entire electromagnetic spectrum—stream forth from this hydrogen-fueled holocaust. In addition, subatomic particles such as protons and electrons are hurled into space carrying with them magnetic fields. This plasma, called the solar wind, blows through the solar system forming a kind of interplanetary weather.

Our own spacecraft earth courses through the solar wind much like a ship plowing through the sea. At its prow, the belts of radiation trapped by earth's magnetic field (the Van Allen belts) are buffeted then flattened by the solar wind and a bow shock wave is formed. Behind, an electromagnetic wake trails out for thousands of earth radii (see Figure 1).

Ordinarily the speed of the solar wind is relatively steady. Sometimes, however, a storm erupts on the sun, and the wind is whipped to hurricane proportions. When this occurs, the earth experiences the assault of a full-blown magnetic storm.

On August 2, 1972, an enormous storm, the largest ever measured in space, suddenly erupted on the sun. Flares leaped hundreds of thousands of miles above the solar surface, and huge discharges of plasma hurtled into space. As the storm slashed out through the solar system, NASA's Pioneer 9 satellite was in orbit between the earth and the sun; Pioneer 10, on its way to Jupiter, was travelling through the asteroid belt. The alignment of the two spacecraft had been anticipated by Pioneer engineers and scientists as an important opportunity to evaluate the normal flow of solar radiation. The giant storm was an unexpected bonus.

Pioneer 9 clocked the gust of solar wind at 2¼ million miles per hour. By the time it struck Pioneer 10, 76 hours later, the wind had slowed to around 1 million miles per hour. Interestingly, its temperature had shot up to nearly 2 million degrees, and the interplanetary magnetic field was 100 times its normal strength. The effects are suggestive of the magnetic "pinch" that scientists seek to control fusion reactions.

After settling down, the sun erupted again on August 7. During this storm NASA's Pioneer 6 satellite counted the greatest number of high energy particles ever seen, over 4,000 times more than normal. In a one hour period, the storm produced energy equal to the U.S. electrical power consumption for 100 million years. As an aside in parting, it warped the earth's magnetic field so severely that power and communication blackouts occurred in Canada, the northern U.S., Sweden and Alaska.

The data collected by these TRW-built satellites during the solar storms of early August are now being evaluated to determine their effect on current theories of the space environment, the earth's atmosphere, and other aspects of space physics. The information is expected to increase our understanding not only of our own star, the sun, but of other stars in the universe as well.

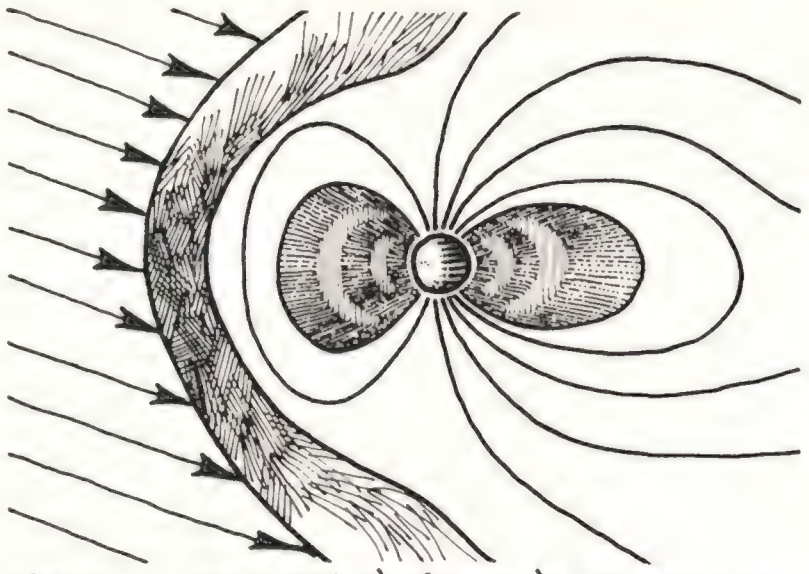

FIGURE 1. THE EARTH IN THE SUN'S ATMOSPHERE

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craft system reliability but because there was no room. Nor, he says, was there any research performed during the flight.

Vladimirov draws a fascinating picture of Korolyov as a brilliant engineer under enormous pressure to produce. He traces Korolyov's interest in rocketry to the 1930s and his imprisonment from 1937 to 1945. While in a "special prison," he designed wings for aircraft builder Andrei Tupolev. Both Korolyov and his deputy Voskresensky suffered several breakdowns in health resulting from pressure of work.

The book does contain several factual errors, such as details of the Sputnik launch vehicle and the seating arrangement in Voskhod. Korolyov is supposed to have started "coming across ever more frequent suggestions in the American press," in early 1957, of intentions to launch an earth satellite during the International Geophysical Year. Actually, President Eisenhower publicly announced this intention on July 29, 1955. A few days later, in a press interview, Soviet scientist L. I. Sedov stated that the USSR would likewise launch a satellite, hinting that it might be rather larger. Still, in a state where factual information on similar programs was under tight security wraps, much that would become known would be through trade gossip such as Vladimirov describes. There is a convincing ring to some of his revelations and absorbing details.

Wernher von Braun has stated that he found *The Russian Space Bluff* "fascinating, informative and worthy of wide readership." This reviewer agrees.

—Frederick C. Durant III
Assistant director (astronautics)
of the National Air and Space Museum

Through the Fish's Eye
Mark Sosin and John Clark
(Harper & Row, $7.95)

This study of game fish behavior may seem to be in primer style, but it comes up with many surprises, even for experienced anglers.

Educated men, for instance, have scoffed at the superstitious custom of spitting on the bait for luck before setting a line for catfish. The authors report that a fish behavioral scientist has discovered that human spit ranks only behind liver and worms as catfishnip.

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The whole subject of olfactory powers turns up surprises. Some fish can detect the odor of essence of seal, a prime enemy, in dilutions of .02 of a drop in a 23,000-gallon swimming pool. This raises the possibility that they can easily detect the odor of angler on the proffered dry fly. The solution suggested? Obvious, after the catfish revelation. Slobber the fly around in the mouth a few seconds, cast it in the water without touching it, and then watch the game fish flock around.

A nice thing for a talkative chap to learn is that the stern fishing buddy who is forever demanding silence knows nothing about the hearing of fish. Human speech, it appears, just bounces off the surface of the water.

Another choice item is the extraordinary sensitivity of fish to temperature change. English scientist Dr. H. O. Bull measured reactions of cod to changes of 1/50th of a degree Fahrenheit. So the writers say, "One of the most useful tools that a fisherman can carry with him is a thermometer . . . . The most useful ones are electronic thermometers that are lowered on a wire." The book publishes a chart of species and their preferred temperature levels. I have witnessed the murderous efficiency of temperature-testing in the hands of Soviet scientists with the trawling fleets on the Grand Banks off Newfoundland. It never occurred to me to use the same technique against our local crappies. But why not?

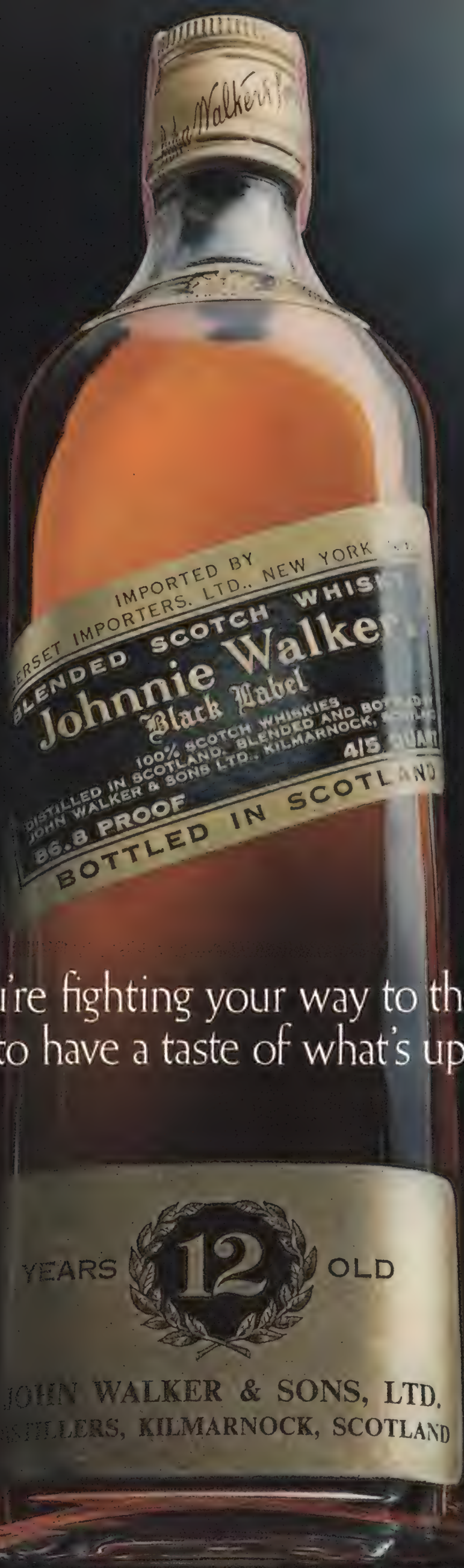
Some of the writing about the environment is careless and undocumented. For instance, the authors claim that the Santa Barbara oil spill destroyed the "delicate estuarine and beach ecosystems" over "dozens and even hundreds of miles." However, recent studies have not produced evidence supporting such a claim.

Also, I should like to see some scientific proof that "oysters seem unable to breed in the vicinity of refineries." The oyster fisheries I know best, the flats of southern Louisiana, are smack-dab in the middle of the most crowded offshore oil industry in the world. And those oysters reproduce with joyful abandon.

Despite the minor complaints, I must recommend to ardent fishermen any book that can make the angler say on every other page, "Hey, I never knew *that*."

—Bern Keating

Author of several books on fisheries, including *The Grand Banks, The Gulf of Mexico* and *Florida*



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Fashions in Makeup
Richard Corson
(Universe Books, $30)

Considering the incredible success of the cosmetics business, there are surprisingly few good histories of the subject.

While the history of costume and hairdressing is easy to trace in pictures, the exact use of cosmetics before the ascendancy of photography and film is much more difficult to assess. Portraits of elegant folk have always tended to show ideally tinted faces which give very little idea of how their makeup, if any, may have looked to the eye. Moralists and satirists, on the other hand, provide vigorously graphic descriptions of thick layers of white curd or streaky and greasy red cheeks, which are difficult to match up with the smooth and creamy paintings. Manuals that give recipes and advice have existed since the dawn of time, and at least one may learn from them what final effects were considered desirable, as well as what means were used.

Fashions in Makeup deals with all these conflicting forms of evidence about cosmetics, beginning with the ancient Egyptians and proceeding through Western civilization until the most recent moments. This satisfying book has a great many illustrations and a brisk, well-written text, illuminated by the right amount of graceful humor.

There are good artist's renderings of cosmetics containers and dispensers and many relevant cartoons and advertisements. Changes in the fashionable ideal face are the most interesting to trace from the works of art—the lashless, browless look of the Renaissance, for example, followed by the thick brows and lustrous, languorous eyes of the Baroque period, or the once-desirable double chin superseded by the hollow cheek of modern times.

A 17th-century belle applying makeup

Mr. Corson's book is full of recipes from all periods which sound either frightful, disgusting and dangerous (including such things as lead, mercury and arsenic) or amazingly cheap and simple (white wax, oil of almond and rose water). But the curious facts emerge that however poisonous white lead repeatedly proved to be, women used it on their faces for centuries, to the despair of critics; that however cheaply cosmetics could be made, women have always loved to spend a lot of money on them; and that no matter how dreadful most men said it looked, women continued to use makeup and break hearts as well.

—Anne Hollander
Currently writing a book on dress and art

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ECOLOGY

Peru. An ecological impact study into the territorial behavior, scent communication, and alpine environment of the endangered vicuna high in the Peruvian Andes. (Limited openings.) See National Geographic Society Magazine, January 1973 article by chief scientist, Dr. William Franklin, Utah State University, April 22 - May 5, $990*.

ANTHROPOLOGY

Botswana. A living experience with the problems and lifestyles of the nomadic Bushmen of the Kalahari, as they struggle to adapt to a changing world. (Limited openings.) Dr. H. J. Heinz, University of Botswana, Lesotho and Swaziland. April 16 - May 4, $1290*.

Ethiopia. Witness and record the impact of an unexpected total solar eclipse on a nomadic people whose daily lives are governed by the movements of the moon and stars. Dr. Asmarom Legesse, Northwestern University. June 24 - July 10, $1390*.

Kenya. An intensive study of the animal husbandry, medicine and magic of the pastoral Pokot tribe of the Great Rift Valley of Kenya. Miss Jean Brown, University of Nairobi and ethnographer, National Museum of Kenya. July 1 - 15, $1290*.

ASTRONOMY

Mauritania. An expedition to observe and record the longest remaining total solar eclipse of the 20th century from the western Sahara Desert. Dr. Donald H. Menzel, Harvard and Smithsonian Observatories. June 15 - July 3. $1490*.

ARCHAEOLOGY

Mexico. Excavation and survey of prehistoric settlement patterns at Becan, the fortified Mayan city in the Central Yucatan Peninsula. Dr. Prentice Thomas, University of Tennessee. May 5 - June 1. $1190*.

Israel. Excavation of a Late Stone Age hunter's hut at Ein Gev near the Sea of Galilee. Dr. Ofer Bar-Yosef, Director, Laboratory of Prehistory, Institute of Archaeology, Hebrew University. August 19 - September 5. $990*.

South Africa. Survey and excavation at Makapansgat and surrounding Transvaal fossil-man caves. Dr. Phillip Tobias, University of Witwatersrand. July 8 - 21. $1265*.

MARINE ARCHAEOLOGY

Bermuda. Underwater expedition to excavate a 16th century shipwreck off the coast of Bermuda. CDR. Mendel Peterson, Curator, Division of Historic Archaeology, Smithsonian Institution. July 28 - August 11; August 12 - 26. $1290*.

Other 1973 expeditions: Geology in Ethiopia, Kenya; archaeology in Sudan, U.S.; astro-archaeology in Britain, Egypt; marine archaeology in Greece, Lebanon; marine biology in Florida, British Honduras; anthropology in India; ecology in Nepal.

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Smithsonian highlights

Freer Gallery of Art
The Freer Gallery of Art will celebrate the 50th anniversary of its opening with a series of special exhibitions and symposiums and the presentation of three Freer medals that will be awarded to distinguished Near and Far Eastern scholars in connection with the observance. On May 2 the Gallery will open a special exhibition of "Ukiyoe" Japanese paintings from the Freer collection. On May 3 and 4 the Gallery will hold an international symposium for scholars on Ukiyoe art. Two additional exhibitions will be held during the anniversary year, one on Chinese figure painting, scheduled to open in September, and another on the ceramics of Islam, opening in January.

Smithsonian Associates
For ticket information on the following events, call (202) 381-5157.

"What's Washington Supposed to Be?" is a symposium on the differing positions of architects, government officials, critics and the public, scheduled for May 21 at 7:30 P.M. in the Museum of History and Technology Auditorium.

"Tallulah, A Memory," a portrait of Tallulah Bankhead in a one-woman production by actress Eugenia Rawls, will be presented in the Baird Auditorium on May 6 at 8:00 P.M.

Museum of Natural History
"Synthetic Crystals" is a comprehensive survey of man-made crystals, showing how they are made, what they are used for and how they differ from natural crystals—Opens May 13.

Smithsonian Speakers
The National Speakers Bureau, a new service provided by Smithsonian Associates, offers an opportunity for organizations within the United States to request curators and other Smithsonian staff members to lecture on a wide spectrum of disciplines. Travel and other expenses are paid by participating organizations. Write: National Speakers Bureau, Smithsonian Associates, Smithsonian Institution, SI 118, Washington, D.C. 20560.

Museum of History and Technology
"The Henry R. Luce Hall of News Reporting" features an audiovisual chronicle of the colorful history, important personalities and technological advances of American journalism.

"Hall of Photography" presents the history of the art and technology of photography, using period settings and continuously scheduled demonstrations of early photographic techniques.

National Portrait Gallery
"Authors" is an ongoing exhibition of portraits of famous American writers from the permanent collection.

Museum Summer Hours
Four Smithsonian museum buildings will be open from 10 A.M. to 9 P.M. each day through September 3 for the convenience of summer visitors. Included in this schedule are the History and Technology, Natural History, Arts and Industries and Air and Space buildings.

Museum Reference Service
The Smithsonian Associates' Museum Reference Service is available to members traveling within the United States. Associates may write for a packet comprised of lists, by state, of many of our country's museums, galleries and historical sites. Brochures are included when available. Please specify the states in which you will be traveling. Allow three weeks for mailing. Write: Smithsonian Associates' Museum Reference Service, Associates Reception Center, Smithsonian Institution, Washington, D.C. 20560.

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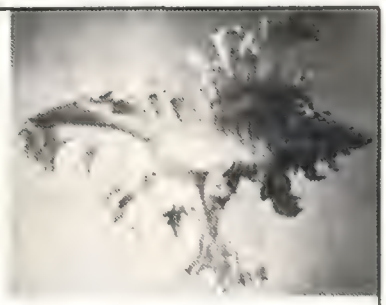

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National Collection of Fine Arts
"Views of the Earth" shows 20 large photographic blowups of aerial views of the Earth taken in the far West by Robert Bucknam. A duplicate version of the exhibition may be seen at the Los Angeles County Museum of Modern Art—opens May 4.

"My Twenty Years of Kinetic Construction" is a lecture to be presented by the internationally known sculptor George Rickey. He will cover his own work and the pioneering achievements of the early Constructivist sculptors at noon on May 8 in the Granite Gallery.

"Children's Day" will celebrate spring with an all-day event that includes monoprinting, demonstrations by artists, a marionette theater, strolling musicians, magicians, treasure hunts and videotaping. Planned for children, age 4 to 12, the program begins at 10:00 A.M. on May 19.

Renwick Gallery
The Gregg Smith Singers will be in a concert in the Grand Salon on May 22 at 8:00 P.M. Proceeds will be used to restore an 1873 Steinway grand piano as a permanent fixture for the Renwick. For ticket information, call (202) 381-5157.

National Air and Space Museum (Arts and Industries Building)
"Exhibition Flying" is represented by the barnstorming Waco 9 (1920-1939); the Turner RT-14, designed exclusively for racing; and the Pitts Special, the type of plane used recently in the World Aerobatic Championships. A replica of the airshow grandstand, with a continuous showing of films of the National Aerobatic Championship team, is open to the public.

Traveling Exhibition Service
There are up to 70 different Smithsonian-sponsored exhibitions on display each month throughout the United States and Canada. For a complete listing and information on how to bring an exhibit to your area, write: Traveling Exhibition Service, Smithsonian Institution, Washington, D.C. 20560.

- Macomb, Ill.—"Makonde Sculpture" (Western Illinois Univ., May 12-June 10).
- Logan, Kan.—"The American Artist & Water Reclamation" (Dane G. Hansen Foundation, May 5-June 3).
- Brookings, S.D.—"Marsden Hartley: 99 Drawings" (South Dakota Memorial Art Center, May 13-June 10).
- Mobile, Ala.—"Education of an Architect. A Point of View" (Mobile Public Library, May 12-June 10).
- Carmel, Calif.—"The Simple Home: Domestic Architecture in the San Francisco Bay Region" (Sunset Community and Cultural Center, May 19-June 17).
- Pottstown, Penna.—"Prehistoric Rock Art of Spain" (The Hill School, May 5-June 3).
- Torrance, Calif.—"Hand of Man on America" (Torrance Library, May 19-June 17).

Smithsonian Commons
Luncheon facilities for members of the Smithsonian Associates are in the original Smithsonian Building. Open Monday through Friday from 11:30 to 2 P.M., the Commons offers a buffet luncheon from $1.40 to $1.85 upon presentation of an Associate Membership card.

Parking on the Mall
Metro construction has made parking on the Mall near the Smithsonian complex extremely difficult. Although numerous measures have been employed to reserve Mall parking areas for museum visitors, the use of fringe parking areas and/or public transportation is still recommended. Current parking information may be obtained by writing to the Smithsonian Associates' Reception Center prior to your visit.

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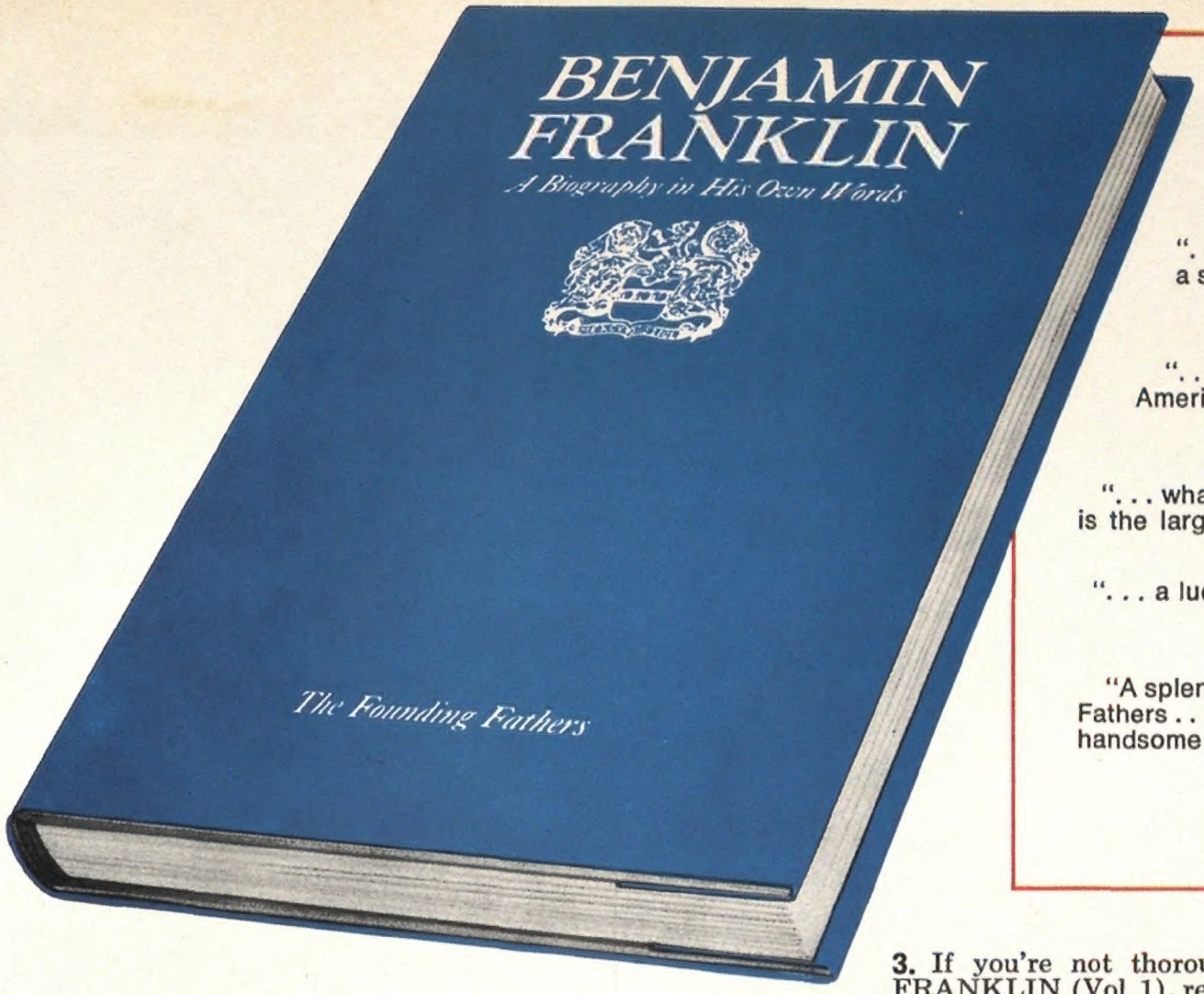

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By Don H. Berkebile

Get a horse? Save us from that *pollution*

Deep within the breast of many crusaders for a better environment lies the thought that the automobile is the true root of all our evils, that inventing it in the first place was the devil's own work and that becoming enslaved by it, as we surely are, has opened the way to our destruction. Back to the horse and buggy, we sometimes murmur as we choke for oxygen on a jammed city street. Back to the days of breathable air, when a person could cross a street safely and with dignity and could park his horse and carriage within mere feet of his destination.

Yet a cool appraisal of horse-and-buggy days casts doubts on the ecological value of the old gray mare. Consider pollution: London, in 1875, had to get 1,000 tons of horse manure off its streets—*daily*. American cities with a population of 12,000 horses (New York had more than ten times as many at the turn of the century) had to remove, daily, a 130-ton hill of horse manure.

Of course it was excellent fertilizer, but could not always be used. If it was gathered from the streets of a small city, it could be sold to nearby farmers, but if the city was large, neighboring farms couldn't absorb all the manure. It was unprofitable to transport it farther than the closeby farms—the cost of transportation was higher than the value of the manure itself.

In such instances, manure was simply dumped somewhere. New York City deposited it on an island in the Hudson.

While waiting to be cleaned up from the streets, manure bred billions of flies which carried at least 30 diseases, some of them quite serious. The horse disease, glanders, for example, could be severe and widespread enough to cripple urban transportation. It was also communicable to humans.

Birds, too, followed the horses, and although they do eat harmful insects, some may carry in their own droppings certain disease organisms which can affect man.

The urine from the horses couldn't even be collected. It added to the filth and stench of the streets and made them dangerously slippery, not only for humans but for horses as well. The animals sometimes fell, injuring themselves so badly they had to be destroyed.

Dead horses, of course, presented another problem. Wherever there was a huge horse population, there were sure to be huge numbers of corpses that had to be dragged away, at great effort and expense. In New York and Chicago, around 1900, as many as 15,000 horses a year had to be hauled off. Footing for the animals was better if the streets were laid of small stone blocks or bricks. But then the filth collected in the cracks. Use of asphalt or concrete made cleaning easier, but slipping increased.

Carriages, with their high center of gravity and uncertain means of locomotion, were accident-prone. Late in the 19th century, Paris could count 700 deaths and 5,000 injuries a year from carriage accidents. Countless accounts of serious accidents can be found in contemporary newspapers, diaries and journals. Runaway horses and capsized coaches were all too common.

As for parking a horse and carriage, remember that the smallest horse-drawn vehicle (four-wheeled) filled a space of roughly 6 by 16 feet, including the horse. Many such buggies could only carry two people. Compare that to today's automobile—6 by 17 or 18 feet—carrying six people. The horse could not be parked on the street all night. It required housing—also constant care and feeding whether it was in use or not. If a horse kept outside the urban area was to be driven into the city's heart, its owner had to allow for a top average speed of about ten miles an hour on a level road.

The costs and problems of horse transport in cities during the early years of this century were so great that many of our forebears looked upon the automobile as their only salvation from urban ills and limitations. Bring back the horse today in sufficient numbers to help accommodate our population, and an even worse situation would be created.

Obviously we must alter our present trend in urban transportation—and inevitably we will. But *not* in the direction of the horse and buggy. Those days are gone, and a good thing, too.

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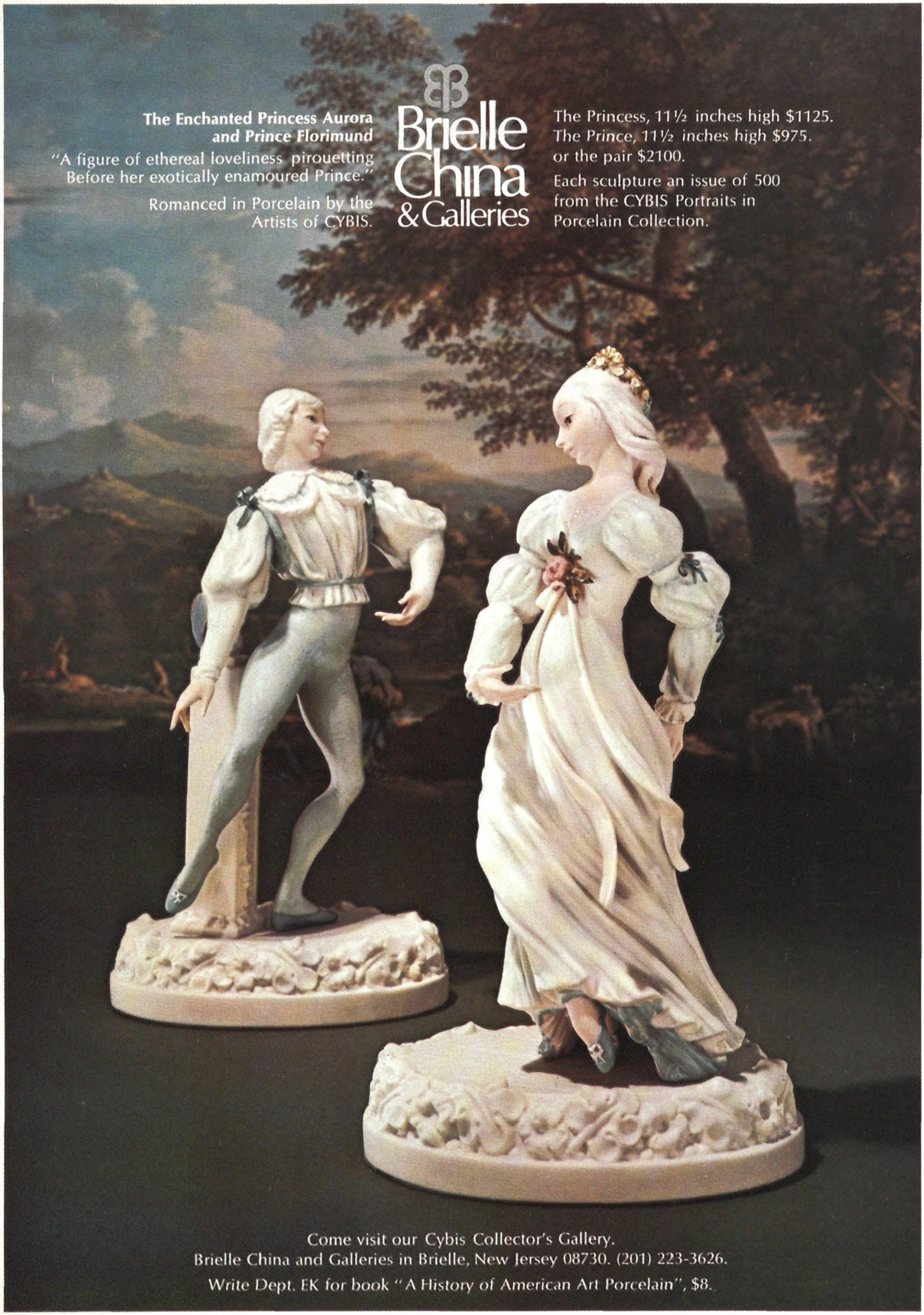
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